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Getting the Most Out of Your Machine Tool Dollar

By G. S. McKee
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We work our machines to the limit of their capacity. If the developments in machine tools in the last five years are any criterion of what is to happen, we are following the right policy. I believe that developments are coming that will make a great deal of our equipment of today very much outclassed

CHANGES in the design of our product, or in our methods of manufacture, and changes in the design of machine tools, or the introduction of machines of new design, cause practically all of the obsolescence of machine tools in the plants of the Timken Roller Bearing Co. Not so long ago, as time goes in a manufacturing plant, the introduction of one change in the method of making our bearing caused the replacement of 300 of one type of machine by 30 of another. The 300 machines were obsolete on that operation although there are other operations in our processes where that type of machine is used. Some of the 300 were retained for the other work and the remainder were disposed of. That one change reduced our payroll by some 70 operators, conserved power and floor space, and it so happened, saved a great quantity of material. It furnishes an example of change in method as well as the success of a machine of new design. I suppose that if we analysed every example of obsolescence, we should find that most of them result from a combination of change in method and change in machine design.

Varied Abilities Needed

It is not often that a sweeping replacement such as that just mentioned is possible. When a chance like that occurs, anyone will take advantage of it. No great insight, no great selling ability or engineering ability are required to put the change across. It sells itself. On the smaller operations, where from one to a dozen machines are under consideration, several kinds of ability may be required. There may be needed selling ability on the part of the machine tool representatives, engineering ability on the part of the production department, and financial ability on the part of the man who endorses the orders.

It is our policy to follow continually the small operation as well as the large, realizing that many savings of the comparatively small variety mount into a considerable sum when taken as a whole.

We will replace even a new machine by another if the replacing machine will pay for itself in a few years, when the calculations are based on cost alone. There may be other considerations that will make advisable the allowance of a longer time for our money to come back.

The example I cited of the replacement of 300 machines by 30, brings to mind another part of our equipment policy, which is to work our machines to the limit of their capacity. Where should we have stood, as regards earnings obtained against earnings possible, up to the time of the demise of the 300 machines, had we nursed them along well within their capacity?

Developments of the Future

If the developments in machine tools in the last five years are any criterion of what is to happen, we are following the right policy. For my part, I believe that developments are coming that will make a great deal of our equipment of today very much outclassed.

During the last five years the increase in automatically operated machine tools has been of great benefit to the manufacturer. Automatic operation does more than release machine operators for other work; it reduces the requirement of manual effort on those who remain on the job and adds to their contentment. In our plants it adds to their income, because rates are adjusted to give the operator part of the benefit derived from changes that increase the production obtained from him. So far as possible on our automatic machines, we are applying magazine feeds so that parts may be shoveled in instead of placed in position carefully.

Our tool departments at Canton and Columbus furnish an illustration of how the worker benefits from increased turn-out. Much of the tool department work has been placed on a piece-work basis. The increased production has been surprising. The company saves money and the men make more money. That is real progress, the kind of progress that is being interfered with less and less

by the workers as they come to realize that one kind of progress makes for another and that the development of machinery has created jobs for men instead of taking jobs away from them.

When wear, and not obsolescence, is considered, the average life of our machine tools is ten years, made up of normal working days. The machines are run to capacity and sometimes over. They get hard usage due to unskilled or semi-skilled labor. Many of them are run day and night.

In referring to the capacity of a machine tool I am considering it as the maker's rating or guaranty. We operate machines at loads above their ratings and we try to get more production than makers guarantee. Sometimes we succeed. We have gone up to twenty-five per cent above the production that was guaranteed.

Some machine tool builders are more conservative than others in rating their machines. Some of our punch presses, for example, are very conservatively rated. We overload them. We recognize, of course, that our maintenance costs are going to be higher than would be normal for loads commensurate with the ratings. We compensate for this to some extent by strengthening the weak parts.

Some reduction in maintenance cost is possible because of the replacement of some cast iron parts by parts made of cast steel. Poor selection of material in that respect is our strongest criticism of machine tools. Bearings give us comparatively little trouble, perhaps because so many of our machines are equipped with our own product, roller bearings. We believe in roller bearings, or we shouldn't be in the business of making and selling them, and we live up to that belief by specifying and making use of our own product as often as we can. We have shown savings, in power alone, of 30 per cent on Timken-equipped machines in addition to a reduction on repair costs. Only the other day we specified a roller bearing on a purchase order for a wheelbarrow. Why shouldn't wheelbarrows be easy to push?

We are beginning to keep a record of repairs. Up to date it appears that repair costs of more than ten per cent for six months, based on original cost, are too high. Either the load is too great, or a new machine is needed. Investigation reveals the fault and the remedy is obvious. A repair-cost record apparently has its virtues as a barometer. About once a year we get a report from the operating department foremen as to what machinery should be overhauled. These reports are compared with cost appraisal cards showing book value, replacement value, length of life and future value to production. After all factors are considered those machines which warrant an expenditure are systematically overhauled in our machine department, the balance being sold or scrapped. We maintain a tool salvage department for all small tools and machines. Before any parts are scrapped they pass through this department to save any parts that have future value. This department pays for itself many times a year. Credit is given it only after the salvaged parts are issued to another department showing that there is use for the salvaged article.

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Special machines occupy a prominent position in our equipment. All of them are designed at Canton, even those for use in our Columbus and Canadian plants, and the experimental work is done here. Most of them are built at Canton. Sometimes we have them built outside, at a contract price, but when we do, it is after the design has been completed and the experimental machine made. On the whole we find it more satisfactory to build all of our experimental machines ourselves, because of the inconvenience of keeping in touch with work done outside the plant and because of the difficulty of making changes. There is a department especially for the building of experimental machinery and when it can it also takes care of building the special machines for the production department, after the experimental machine has been proved satisfactory.

In the tool room we find that quantity production sometimes justifies, in fact demands, special machinery. Recently it was necessary to buy a slotting machine to handle the work done up to that time on milling machines by means of slotting attachments.

In buying equipment requiring special knowledge we make use of the factory engineering department, the tool equipment department and the metallurgical department. The heads of these departments come into direct contact with the equipment salesman. Recommendation for approval on the final selected equipment is made by one of the above department heads to one of the operating vice presidents of the company before the order is sent out by the purchasing department.

When a proposition of great detail is up, the foreman who is to handle the equipment takes part in the consultations. He is called in because of his knowledge of details and because of the assistance he will render later in getting the equipment across in the shop. There is always some difficulty in educating the rank and file up to new methods and the right kind of foreman, fully acquainted with the new venture, is of great assistance.

To help him on his job and to insure that the new method, which usually involves new equipment, gets a fair trial, the initial work is ordinarily done in a department devoted to experimental work. Thus work on the production scale has been accomplished when the equipment goes to the production shop.

Most of our equipment is bought on trial. We find that usually we can make the guaranties given by the maker. If we can't, we may return the machine or we may keep it, depending upon what it accomplished and other special conditions. When we retain it in spite of its not coming up to guaranty, we do so because it is better than anything else we can get. Perhaps to retain a machine under those conditions is bad policy on account of its tendency to encourage over-guaranty. However, there we are, with production requirements staring us in the face, and a choice of using the equip-

ment or taking the altruistic step of returning it. I admit that we have more faith in the manufacturer from whose equipment we get a little more than he guarantees than a little less.

When we get more than we expected from a machine we have somewhat the same attitude toward its maker that we have toward the machine tool salesman who is of real service to us. I think it is well known that there are "just salesmen" and that there are "engineering salesmen" of machine tools. I am leaving a lot unsaid, when I confine myself to the statement that one of those two groups helps us immensely.

In selecting equipment the matter of drive comes up for discussion. Our preference is for the group motor drive, with single-pulley machines, in production work. In the tool room individual motor drive is preferred. Our steel mill equipment is driven by individual motors to make it the more easily serviceable by overhead cranes.

When equipment is to be disposed of it is sold on the second-hand market if there is one. If none is immediately available the machines will be held or scrapped, depending upon the amount of storage space available. Much of our obsolete and worn out special machinery is broken up, because it is of no value to any one else.

Like other progressive plants we know that we must be constantly alert to learn of all new equipment and processes that might be of value to us. We encourage our factory executives to visit other plants, we study the technical magazines, and we keep our machine design and engineering departments always on the lookout. We recognize the obligation of the manufacturer to keep pace with the developments in equipment and we know that he profits to the extent that he does so.

[The preceding article is the eleventh under the title, "Getting the Most Out of Your Machine Tool Dollar." The first article, by J. A. Smith, General Superintendent of the General Electric Co., Schenectady, N. Y., was published on page 409, Vol. 62. The second, by C. A. Shaffer, General Supervisor of Machinery and Tools of the Illinois Central Railroad, was published on page 521, Vol. 62. The third, by Robert F. Runge, Vice-president of SKF Industries, Inc., was published on page 719, Vol. 62. The fourth, by L. C. Morrow, Managing Editor, *American Machinist*, outlining the policies of the International Harvester Co., was published on page 793, Vol. 62. The fifth, by G. T. Christopher, Factory Manager, the Dayton Engineering Laboratories Co., was published on page 907, Vol. 62. The sixth, by D. C. Wright, of the H. W. Caldwell & Son Co. plant of the Link-Belt Co., was published on page 1, Vol. 63. The seventh, by T. C. Vail, superintendent, the Spicer Manufacturing Co., was published on page 175, Vol. 63. The eighth, by E. R. Norris, director of works equipment, the Westinghouse Electric and Manufacturing Co., was published on page 255, Vol. 63. The ninth, by Fred H. Colvin, Editor, *American Machinist*, was published on page 417, Vol. 63. The tenth, by Wm. Bailey, production manager, the Hoover Co., was published on page 917, Vol. 63. Other articles on the same subject will be published in forthcoming issues.]

Increasing Production with the Employees' Cafeteria

By Russel J. Waldo

THE shop cafeteria, at present, is reaching an increasingly great degree of popularity, not without some merit. The average employee is not up early enough to stimulate a good breakfast appetite. The usual program is to rise, eat hastily and go to work. The consequences are that about ten o'clock he begins to feel hungry. It is about this time in the morning that production begins to decrease with a loss both to the employer and to the piece-work men.

To meet this common habit of living, some companies have adopted the practice of giving their men an opportunity to purchase milk or pie or some other similar food. The idea has proved so successful that frequently the morning production over four hours time has become greater than the afternoon production during five hours.

The same principles may be carried out, however, on an even greater scale. Cafeterias have been established in many organizations, not from any altruistic motives or from a sense of generosity, but because the cafeteria saves enough in increased production to more than offset the operating loss that it sometimes entails.

The increased efficiency of the worker is brought about by the cafeteria service in a two-fold manner. In the first place, the workman who, at noon, is able to get a good hearty meal will be better fitted to go about his job than the one who, for lunch, brings cold sandwiches to the factory. In the second place, a good, clean and up-to-date cafeteria will give him a new environment—a change from the scenery with which he is confronted while at work. He has the advantage in spirit or morale over the employee who squats on the planer table to munch his lunch-pail meal. He retains his ambition to a greater degree than does the employee of the "lunch-pail" variety.

The workmen return to their jobs in a better mood and in better spirits if they have the opportunity to enter into the rather social atmosphere of the cafeteria lunch-room because they have the opportunity to rest their minds and forget the routine of the shop.

One organization permits the employees to remain in the lunch-room during the entire noon hour, to read papers and magazines. Furthermore, it furnishes the papers and reading matter. The co-operation that an organization such as this one receives may be traced to the strength and contentment that are resultant from the lunch-room.

Some plants that adopted the cafeteria as an inducement during the labor shortage and who later dropped this service when there was no longer a need for such inducements found it necessary to resume the cafeteria operation because there was a decided decrease in the production figures that were given them by their cost-keeping departments. They found it profitable to pay out of the treasury the deficits that the operation of these cafeterias sometimes incurred.

Companies who devote a great deal of time in seeing that their boilers get the proper fuel will do well to see that the human machines are properly stoked. The employees will be able to get better results and more power from the old boilers.

The equipment need not be elaborate at the start. Serve good wholesome food in a clean room away from the plant in which the employee works. One plant uses a room 35x40 ft. seating at one time 106 men and feeding a force of approximately 400 between the hours of twelve and half past one. The factory help have their lunch hour between twelve and one and the office force, coming to work later, have their lunch hour after one. The Studebaker plant, for example, has lunch hours beginning from half past eleven and every half hour following.

The result is refreshed workmen who benefit as much from the change in environment as from the warm meal. The two advantages make him a more efficient and more profitable investment for the employer.

Brazil as a Market for Industrial Machinery

By M. A. Cremer
Assistant Trade Commissioner, Rio de Janeiro, Brazil

BRAZIL, the largest country in South America, with an area greater than that of the United States excluding Alaska, offers attractive possibilities as a market for industrial machinery. Brazil now finds herself in a position analogous to that of the United States just before the Civil War, needing highways, railroads and agricultural development. As a result, there is an ever-increasing demand for industrial machinery. The population of the country is growing rapidly, because of the high birth rate and immigration. With her people inclined toward manufacturing, with a government favorable to industrial development and a large market which should increase as individual purchasing power expands, Brazil offers opportunities that should not be overlooked by the American manufacturer.

There are factors, as is to be expected, which limit temporarily the development of the Brazilian import trade. One of these factors is the low per-capita purchasing power of the people. This condition will be relieved as the country progresses, since the individual's wants will increase as his buying power increases. Another factor which tempers conditions in the import trade is the low exchange value of the milreis during the past five years and the consequent weakening of the potential purchasing power of the people.

Because of the reduced value of the milreis on the exchange, Brazil today is, in many respects, a price market. While quality is desirable, price is often more important in the mind of the buyer. The general tendency seems to be to delay the purchase of machinery and to continue the use of old equipment and methods.

German Colonists Working

Some sections of Brazil are progressing more rapidly than others. The central and southern states will probably experience great development in the next few years. Parana, particularly, is scheduled for big things. An influx of German immigrants is forming colonies at various points. Coffee and cotton raising, as well as other industries of the soil are being encouraged by the government. Continued prosperity will result in increased manufacturing needs, although, in view of the present conditions, the growth will not extend to the production of machinery requiring principally iron or steel, except on a small scale.

In order to promote certain industries, the government exempts them from the payment of import duties on the machinery and other equipment required. These concessions are granted through the tariff law and must be approved yearly by the congress. Favors are sometimes granted to the first three companies or individuals engaging in a certain branch of activity. The Ministry of Agriculture may also contract with an individual or company to permit free entry, in case the machine is for the development of an activity benefiting the country.

The fact that machinery of a certain make has been used successfully in Brazil means much to the prospective buyers. Very often a man will specify machinery "such as used by Señor ————," or he will call for the particular make with which he is acquainted. A most favorable impression is made particularly in the case of a large installation where the equipment is already in operation. It is difficult to sell an installation with only blueprints to work with and the buyer must have a great deal of confidence in the seller before he will consent to give an order on such a basis.

The Portuguese, especially, are, in many cases, extremely conservative and it is difficult to convince them that a change will work for their good. These people prefer to stick to the ways with which they are familiar. To some extent, their lack of progress can be explained by this tendency in lines of industry in which the Portuguese predominate.

Low Wages Retard

The low cost of labor retards the use of machinery in some instances, although this situation is changing in the central coast states due to increasing labor costs as well as a shortage of help. Wages, however, have not kept up with the general increase in prices and cost of living.

The illiteracy and lack of education in the lower class tend to discourage the use of the most modern types of machinery and often the fine points of an up-to-date installation are not understood. The contrivances that make for complete efficiency frequently are not used. Rough and ready machinery that will stand lack of attention is often preferable. It should be pointed out that mechanical knowledge in Brazil is limited.

In only a few cases is competition so keen and manufacturing on such a high plane that improvements are readily sought for. The search for and maintenance of efficiency in industry in order to keep down overhead is not a fetish with local manufacturers so long as they can make satisfactory profits without putting forth efforts in this direction.

In marketing a machine the question must be asked, "Is the customer desirous of getting the best or not?" On the whole, English prices approximate ours while the Germans can, in the majority of cases, underbid us. So far, in general, we are holding our own. We are satisfied to compete with England on an equal footing and can beat German competition where the price is not the major consideration.

Besides the factors of quality, price, credit and reputation, a factor of great importance is the investing and managing of public utilities and railways in Brazil by the country's nationals. The British have invested approximately one hundred and fifteen million pounds sterling in public development companies and utilities. These concerns confine their purchases as much as possible to English products, irrespective of competition. While import statistics sometimes show big imports of certain classes of machinery from England, American goods have not felt the competition.

The reputation for fair dealing which the British have in Brazil redounds to their advantage, while Americans, in general, suffered as a result of the short-sighted methods followed by a few mushroom foreign traders during and shortly after the war. Whatever antipathies were aroused are gradually being forgotten, however.

Abstract.

Making Elevator Units in the Otis Plant

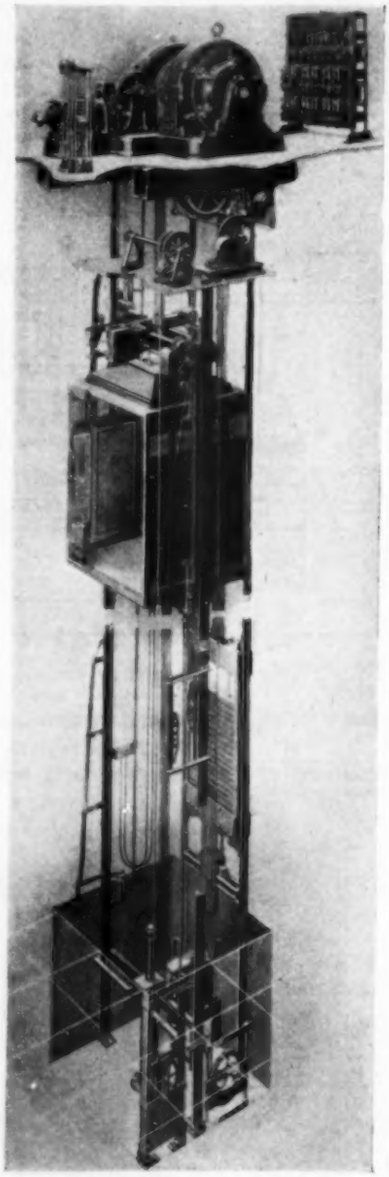
Method of machining sheaves—Milling magnet-frame covers—Various drilling and planing operations—Milling and boring gear cases

By Frank W. Curtis
Associate Editor, *American Machinist*

PRACTICALLY all modern structures are, today, provided with elevators, the type and size depending on the requirements of the building. Some of the larger office buildings, for example, are furnished with elevator equipment that offers ease of control, rapid-handling facilities, self-leveling operation, fast operating speed and other similar improvements. The more recent types of elevators are now able to obtain a speed of 800 ft. per min., being constructed to insure absolute safety and to operate in such a manner as to eliminate the usual "rising" and "descending" sensation so often found in the older types.

To the average individual, an elevator does not appear to be a complicated piece of construction, perhaps on account of his not seeing the operating machinery. The car or carrying portion is probably the minor part of an elevator installation, the actual works being located overhead or in the shaft base. The heart of an elevator, therefore, consists of the operating motors, sheaves, automatic controls, balancing devices, gear mechanisms and safety appliances, all of which are hidden from the view of the rider. Safety methods have been developed to enable a large passenger elevator to be "cut loose" at a high elevation, resulting in no harm and without causing its occupants to become excited.

The machining operations shown here illustrate some of the methods of producing a variety of parts as adopted by the Otis Elevator Company at its plant in Yonkers, N. Y.



That an elevator is a complicated piece of machinery may be seen from this illustration of the overhead and base works

Some of the larger work is handled in the boring-mill department where 17 boring mills, having a capacity up to 60 in., are in continuous operation, producing such parts as sheaves, pulleys, drums and similar circular work. In Fig. 1 is shown a sheave 34 in. in diameter, being machined on a Bullard vertical boring mill. The work, a 25 per cent semi-steel casting, is held in a 3-jaw chuck that grips the inside of the flange while the outer portion of the jaws is used for the horizontal location. Fig. 2 shows at *A* a layout of the tooling used. The work is first moistened with kerosene to loosen the scale after which the turning and facing tools shown at *B* are used to rough their respective surfaces. These tools are operated together, one being fastened to the sidehead and the other in one of the turret faces.

For facing the hub, the turret is lowered to the depth required, using the same tool as at *C*. At the same setting, the underneath face of the hub is faced as shown at *D*. The toolholder is supported by the arm *E* that is long enough to offer ample clearance when the tool is in operation. The center hole is bored by a tool also located in the turret as shown at *G*. During the cut, the grooves are roughed to size by the tool at *H*, seven grooves being machined on the sheave shown. The depth of the groove is 1 in. and the width at the top is $\frac{3}{4}$ in. The finishing tool shown at *K* completes the grooves by scraping the bottom surface of the grooves and forming a circular seat that acts as the guide for the elevator

The first part of the article. The second part will appear in an early issue.

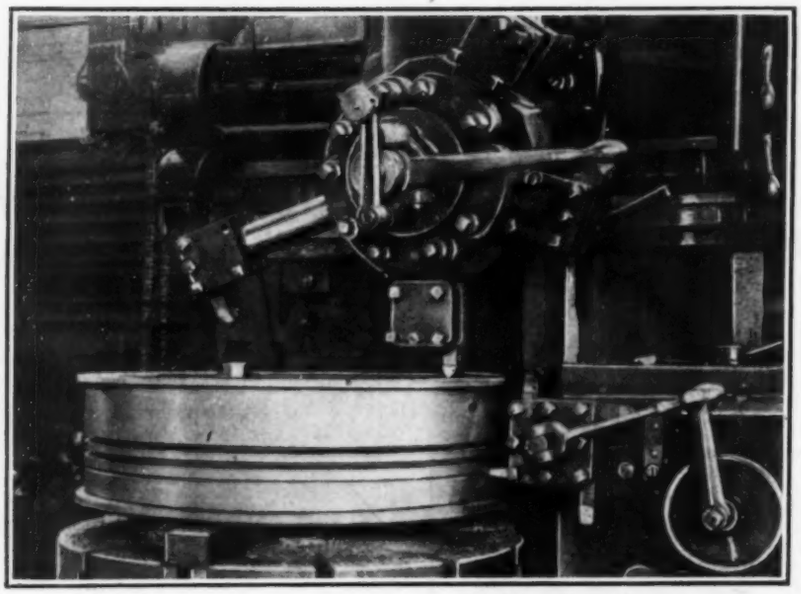


Fig. 1—Set-up used for machining sheaves

cables. Both the rough- and finish-grooving tools are located in the side-head. After completing these surfaces, the work is turned over for finishing the surface *M* that is used for locating purposes on the first set-up. With the exception of the finish-grooving tool, the work is machined with stellite tools. The turning and facing is accomplished at 80 ft. per min. with a feed of 0.093 in. per revolution. The rough grooving forms an ideal application for stellite, operating at 90 ft. per min. with an 0.018-in. feed for the first groove, thus giving the tool a chance to heat up, after which the speed is increased to 128 ft. per min. with an 0.033-in. feed per revolution for the remaining grooves. The life of the tool runs as high as 240 grooves per grind. The entire operation is completed in 55 minutes.

In Fig. 3 is shown the method of straddle milling magnet-frame covers. A Potter & Johnston index milling machine provided with two fixtures, each of which holds 10 pieces, is used. While one fixture, shown at *B*, is in use, the other at *C* is being loaded with the work such as shown at *A*. Fig. 4 shows the constructional details of the fixture. The work *A* is placed in the fixture to rest on the hardened blocks *B*. The hinge *C* is then swung down, being locked by the thumbscrew *D*, after which the headless setscrews *E* are adjusted so that they tighten the equalizing clamps *G* against the work. The handle *H* is forced down, in the position shown, which throws the plungers *K* against the work and in turn locate the work against the plate *L*. The screw *M* is used for tightening the work endwise, the thrust of which is taken by two screws *O*. The cutters are set by means of 0.020-in. feelers that are located on the hardened pins *P* so the width between the cutter faces is 2.622 in. The cutters are 8 in. in diameter and operate at 78 r.p.m. and 5¾-in. feed. The work is held to limits of ±0.005 inch.

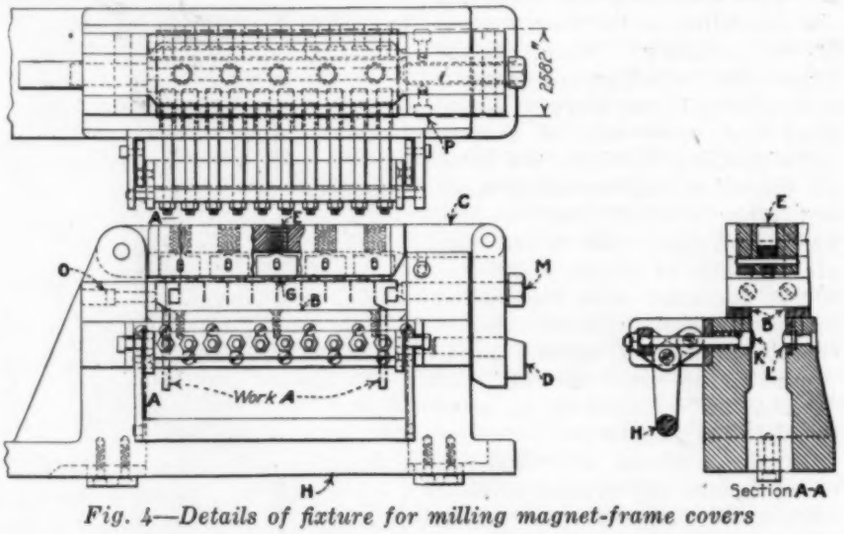


Fig. 4—Details of fixture for milling magnet-frame covers

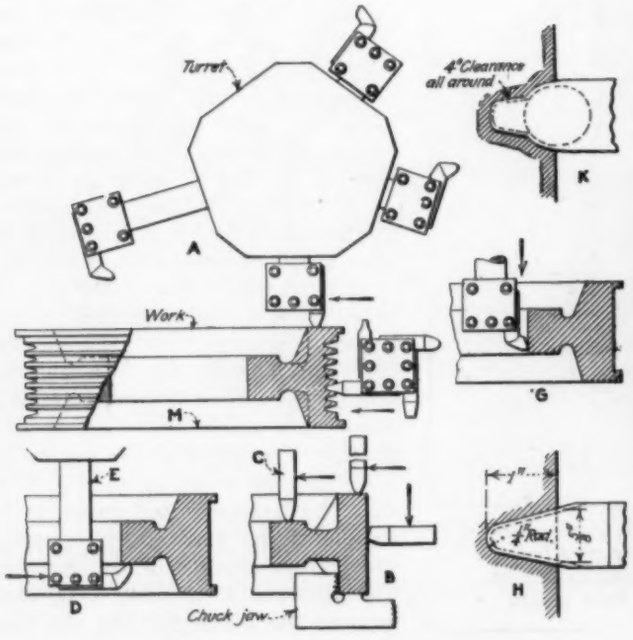


Fig. 2—Tool layout for sheave operation

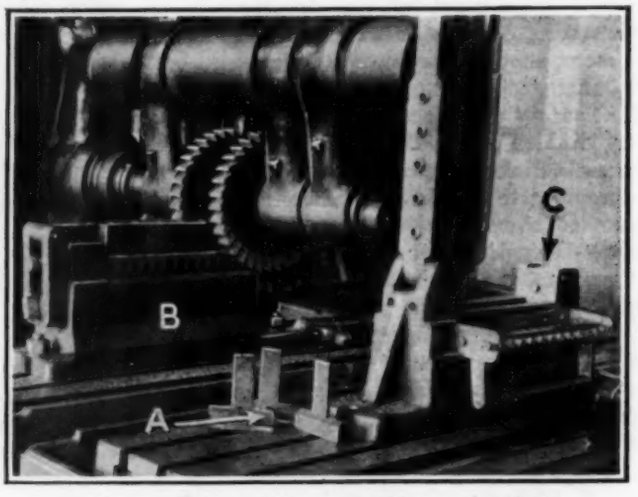


Fig. 3—Index milling machine operation

The majority of elevator units require in their construction a worm gear reduction mechanism comprising worm and worm wheel and an upper and lower gear-case, together with other smaller parts. Since the lower gear-case contains the bore for the worm and half of the bearing for the worm wheel it is necessary to machine this part to close limits. In Fig. 5 is shown one of the various sized cases in detail. The faces and bores must be in line, so for this reason the machining of the sides *A* and *B*, the faces *C* and *D* and the bore *E* is all done in one setting. In Fig. 6 is shown the method of handling the machining on a Newton duplex milling machine. The work *A* is located in the fixture *B* on four locating points and a central V-block, then clamped in place by four strap clamps and four setscrews.

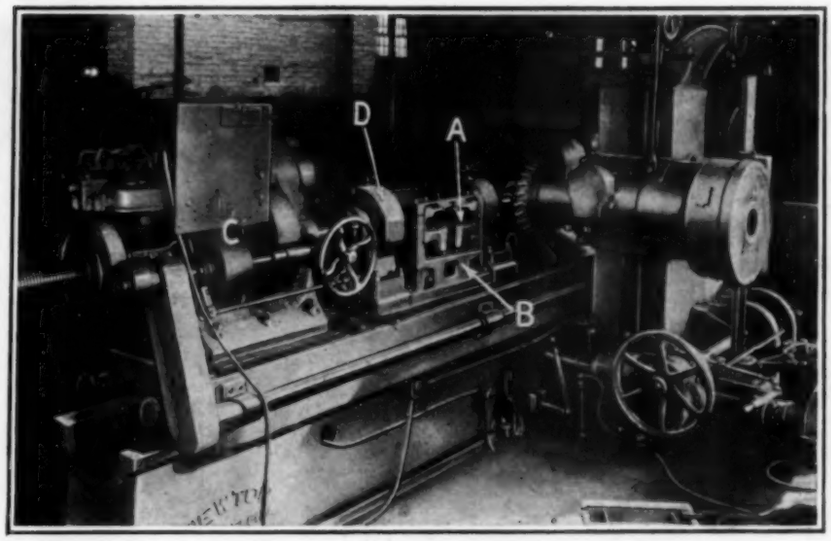


Fig. 6—Milling, boring, and facing lower gear-case

On each end of the machine table is mounted a special boring unit *C* driven by an individual motor. The boring bar in this unit is provided with two rough-boring tools, one finishing tool and a chamfering tool for sizing one side of the work. As the boring bar feeds into the work, the facing head *D*, used for finishing the 8-in. face, is automatically brought in operation by means of gears and cams operated in conjunction with the boring bar. Both boring bars work in unison, being controlled from the side of the machine shown in the illustration. After the boring is started, the operator moves the machine table in position so the inserted-blade milling cutters straddle the two sides of the work. As this portion of the operation is completed before the boring and facing, the table is withdrawn to the position shown. After the correct sizes have been maintained and the tools properly set, the operation consists only of loading and unloading the work and operating the controls of the machine. Two machines of this type are in operation machining a variety of sizes of cases, the one shown being completed in 20 min. In handling the work by this method the company is able to produce the part so that the bores and important sides and faces are in line with one another.

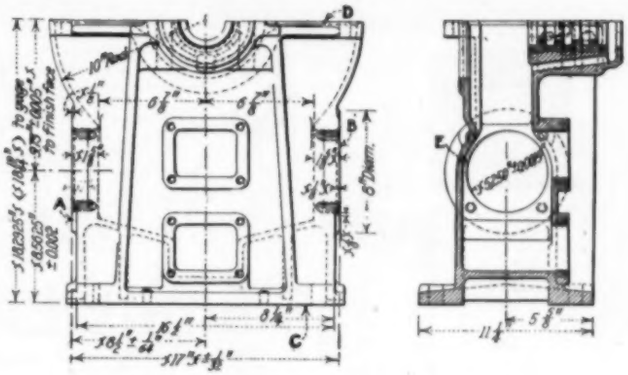


Fig. 5—Details of lower gear-case

Machining Yokes

An unusual form of a drilling, tapping and milling operation is shown in Fig. 7. The work is a cast-iron brush yoke, made in two sections, 36 in. in diameter, requiring six elongated slots *A* and twelve ½-in., 13-thread holes in the upper frame *B*. Two setscrews such as shown at *C* are used for tightening the six projecting arms of the work while the setscrews as shown at *D*, located in swinging clamps, hold the work in place. The jig *E* is placed over two guide pins, such as shown at *G*, and locked in place by a double-end C-clamp *H*. Two ⅞-in. holes are drilled in the arm after which the jig is removed, the table indexed and the remaining arms drilled. A ⅞-in. helical milling cutter *K* is then used for connecting the holes, this being operated by revolving the work table by the handwheel *L*.

The holes for the ½-in. tap are drilled by means of a swinging jig *M* that is pivoted on a stud at *O* and locked in its respective position by a tongue and slot.

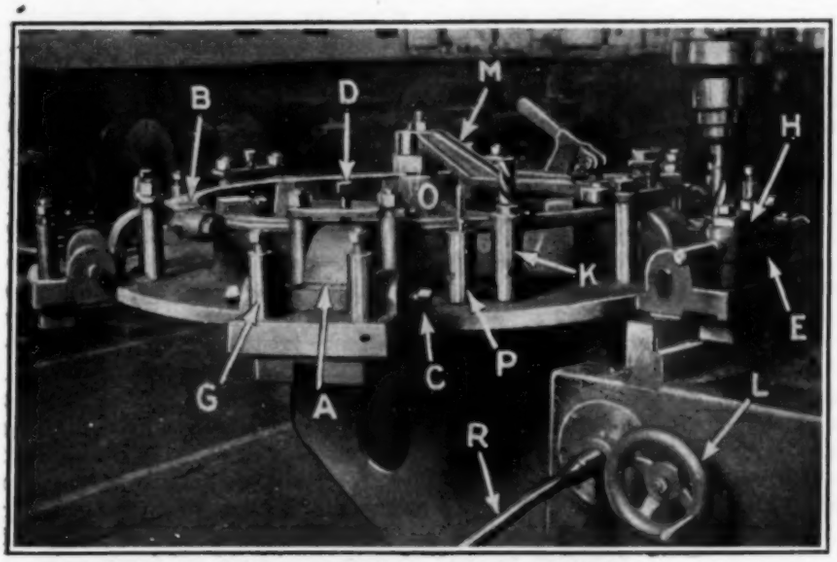


Fig. 7—Drill jig of unusual design

The twelve holes are drilled, the jig removed and the tap *P* used for completing the operation. The rotary table is operated backward and forward by the handle *R* so the spindle of the machine may be positioned to

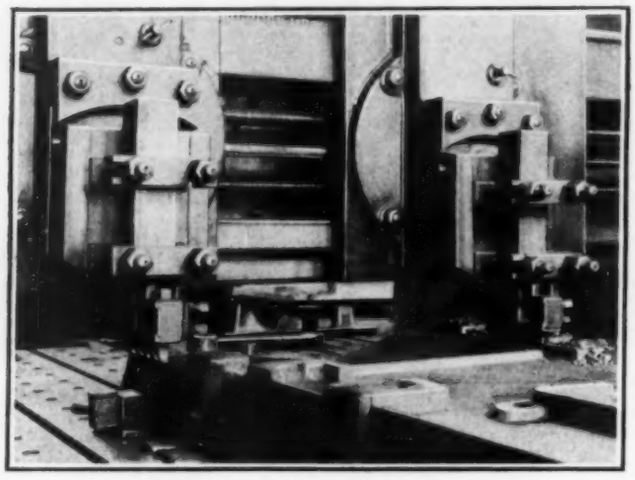


Fig. 8—Planing bedplates

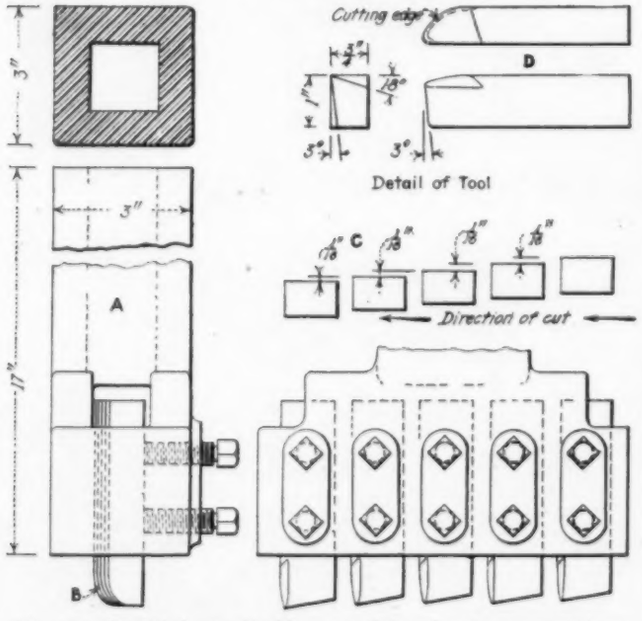


Fig. 9—Multiple toolholder used in planing operations

suit work of various diameters. The machine is a Cincinnati drilling machine equipped with a tapping attachment. The operation as performed has solved successfully handling of a rather odd-shaped piece of work that formerly caused difficulty.

Planing Bedplates

The method of planing bedplates on a Cincinnati planer is shown in Fig. 8, while in Fig. 9 are shown details of the multiple tool used. The body *A* is cast steel, cored out at the lower end for five tools *B*, each of which is held by two setscrews. The tools are located in steps of $\frac{1}{16}$-in., as shown at *C*, so that at each stroke of the table a $\frac{1}{16}$-in. feed is obtainable. In this way it is possible to finish a large surface in much less time than by using the usual single tool. At *D* are shown details of the toolbit including side, end and rake angles.

(To be continued)

Seen and Heard

By John R. Godfrey

Shop equipment and personality—Prejudice in buying

THERE are several ways in which production can be secured in any shop. The two main methods can be called personality and equipment. In the first, the management secures results in spite of poor equipment, while in the latter good equipment may play the bigger part. A combination of the two methods is the prize winner of the lot.

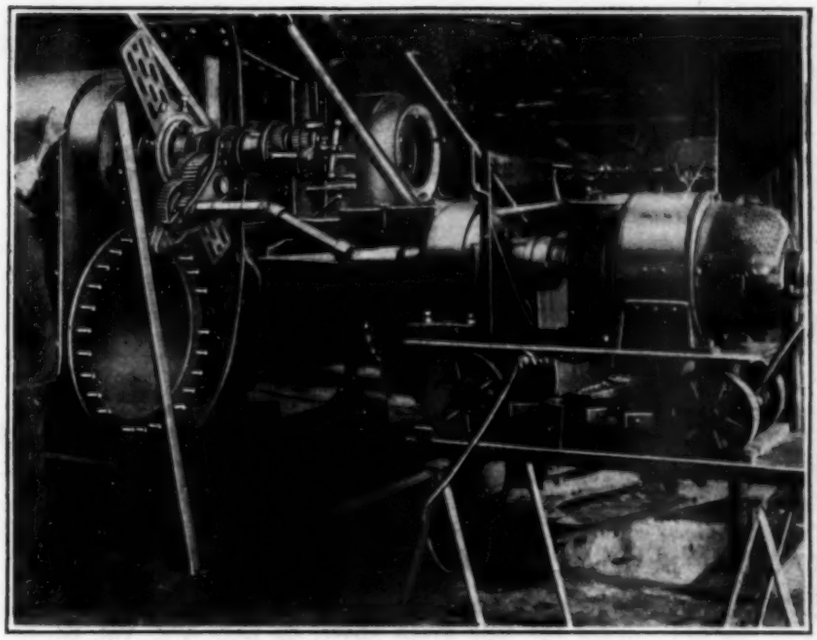
I have in mind two shops that have shown splendid results with inadequate equipment, much of what they had being fit only for the junk pile. In both cases the good results were due to the ability of the management to secure complete co-operation of the men, owing to the personality of the manager. A square deal, full credit for results secured, and the feeling that they were really part of the organization and not merely "hired hands," spurred the men on to give their best. One shop builds motors and the other is a railroad repair shop of a large road.

In one of these shops the time came when even the wonderful personality of the manager and the skill of the men could not overcome the handicap of poor equipment. New equipment is being bought and methods are being rapidly improved. The other is likely to remain a poorly equipped shop for some time to come.

The motor shop has adopted a system of selecting and buying equipment that reserves careful attention by all who want the best. It has a sort of committee of young engineers with production experience. They are old enough to know production requirements but young enough to be free from many of the prejudices that sometimes afflict the older generation. It isn't easy to forget that a firm once built a poor apology for a machine, even if it has reformed and now builds a good one. A few of the older men are able to revise judgments and to keep pace with the times, but some are apt to ignore changes or improvements especially if they are over fifty. Hence the younger men on the committee.

These engineers study the problems of their shop, visit other shops and finally decide on the machine best adapted for their work. Then they sell the idea to the men who are going to use it, to the foreman and his key man. After that, it's up to the purchasing agent to buy that particular machine and not shop around for one "just as good." If there is any second best, or equal choice, all are mentioned in the report of the committee.

This method is in marked contrast to the methods of certain well-known railways, or at least to one division of the railway referred to. There are young engineers in this shop too, but they are not encouraged to study shop methods to any great extent. For here, the purchasing agent still has czar-like powers as in days of old, and he calmly announces that the only thing that interests him in buying machinery is the *price*. Nothing else matters. And he proved it by buying a bunch of second hand lathes of a make that never pretended to be in the first class, much to the surprise of the dealer who made the bid. Fortunately, this is not typical of the best railway practice today or we might despair of the future of our transportation.



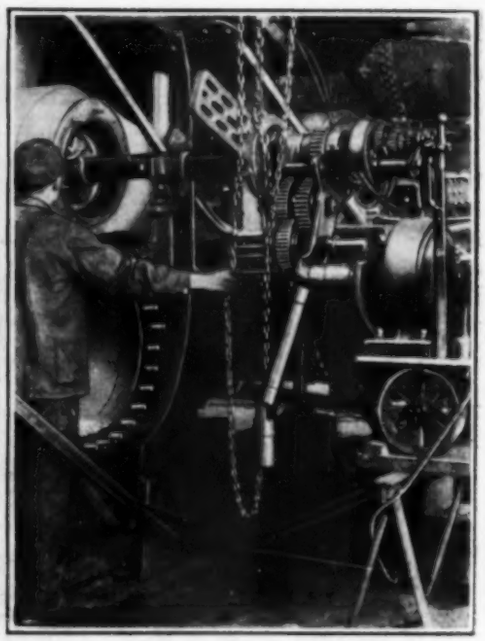


Fig. 1—Boring bar at work on valve chamber. Fig. 2—Bar withdrawn to show both cutter heads

Standardizing the Reboring of Valve Chambers

By Frank C. Hudson

The mechanism and methods used at the Battle Creek shops of the Grand Trunk Railway—Setting boring-head cutters in the toolroom

WHILE there is nothing new in reboring locomotive valve chambers in the back shop, there have been several changes in methods since the days when a small steam engine or a flexible shaft drove the boring bar on its weary way. Fig. 1 shows a modern boring head at work reboring a valve chamber, the same rig being used for the cylinder by substituting the proper boring head.

A 3-hp. electric motor connected to a Ganschow 17 to 1 speed reducer, and used as a portable power plant for boring or facing cylinders or valve chambers is shown in Figs. 1 and 2. This device operates much more steadily than those driven by air motors, has variable speeds of 4 to 1 and costs 7c. per hour to operate while reboring cylinders of the heaviest type. According to tests made in these shops, the cost of power of the best type of air motor available on the same job, was 33c. per hour. These costs are not guess work, but were determined by the use of an Esterline graphic recording-meter and a pneumatic toolmeter.

The illustrations also show the boring bar with two special cutter heads, arranged to rebore the chamber for both back and front bushings for piston valves, simultaneously. The heads are adjusted in the toolroom and kept sized, according to number, each set increasing in diameter by $\frac{1}{16}$ in. Thus, when the repairman calls for a set of No. 1 heads, a pair set to 14$\frac{1}{16}$ in. in diameter would be sent to the erecting shop. Each of the three tools in the head is set to cut 0.005 in. difference in diameter, the smallest diameter leading the others.

The drawing, Fig. 4, shows details of the device used for setting the tools to the required diameter, also the method of neatly holding them when not in use. In Fig. 1, a pair of cutter heads may be seen on the platform.

Setting the cutter is an important part of the cylinder boring job, and the tool setting stand for the boring heads, shown in Figs. 3 and 4 is of special interest. The stand carries twelve cutter heads, three on each side. The top is arranged to hold a head in a horizontal position while the cutters are being set. This stand is kept in the toolroom.

A central stud carries the cutter head, and the three arms shown hold hardened-steel gage plugs to give the desired sizes. These plugs are numbered to correspond

to the setting of the arms and are held in place by the knurled nut shown at *D*, Fig. 4. A ⅛-in. keyway that fits a dowel, insures the setting gage being replaced in the same position in which it was originally ground.

The plugs are ground to the proper radius and diameter as shown at *C*. Each plug has a shank of different diameter and each set is kept in the racks shown. The spools, made of wood, are staggered and are held by ¼-in. through bolts.

By making the plugs for each arm of the gage with a different size of shank, it is impossible to make a mistake in setting the plugs and insures both a saving of time and

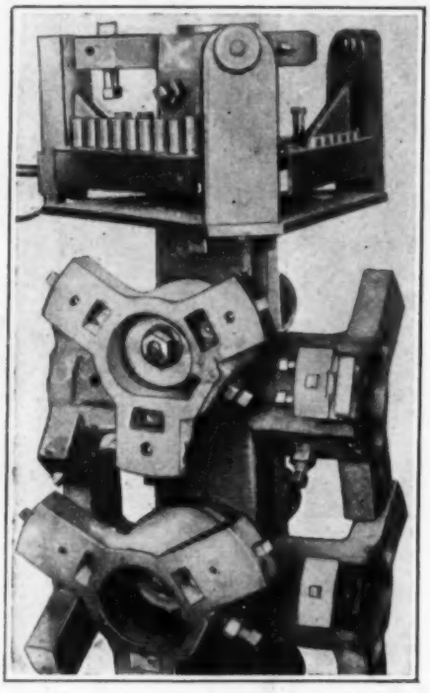


Fig. 3—Stand used in setting cutters

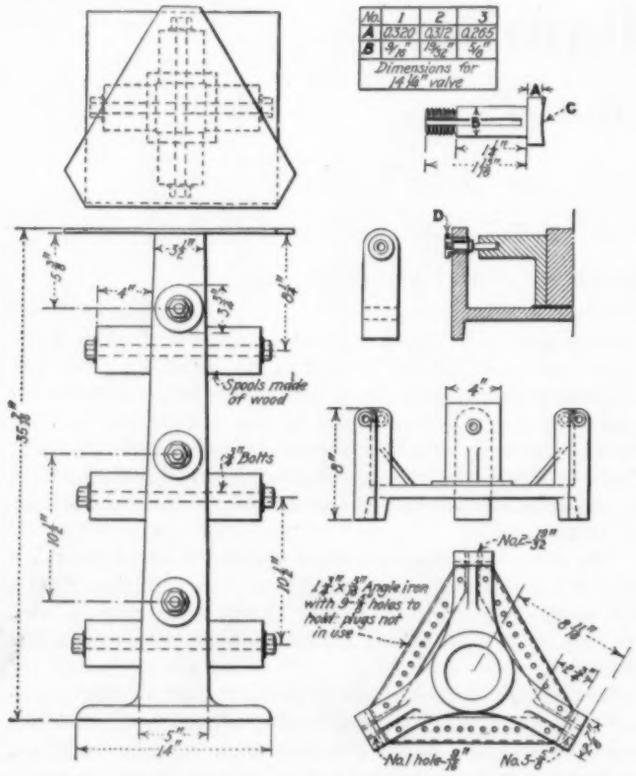


Fig. 4—Details of the stand for cutter heads

that the holes will be bored to the diameter intended.

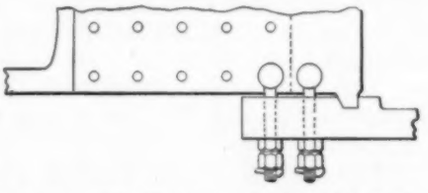
This practice of boring valve chambers to standard sizes has much to recommend it, and might well be extended to other parts of the locomotive, such as the cylinders themselves and valve motion rod bearings. In the same way there can be standard *under* sizes for crank pins, axles, valve motion pins and similar parts.

It is usual practice in most railroad shops to just "clean up" worn surfaces, although many roads are beginning to standardize on the widths of crosshead shoes and similar parts. There is a great opportunity to extend this plan of standardization much farther. In the case of valve motions, for example, standard over sized bushings and pins can be made in quantity and kept in the store room ready for use. This permits greater economy in making the parts and, what is more important, reduces the time that the locomotive must stay in the shop, minus its earning power and adding to the cost of repairs.

The Meanest Job in the Back Shop—Discussion

BY C. G. WILLIAMS

While it may be that B. O. Server has overheard the conversation of mechanics in railroad shops discussing various jobs, as he has told us in the article under the title given above, on page 472, Vol. 63, of the *American Machinist*, the writer is very doubtful if a real honest-to-goodness railroad mechanic would call overhauling a stoker, repairing a booster, repairing triple valves or stripping, cleaning and repairing dirty brake cylinders, rotten and mean jobs. No old timer would be bothered by such a job as "locating and cutting by hand, a set of key ways in a driving axle" or "pressing on wheels after crankpins had been applied and get the pins in correct alignment." Nor would the old timer complain at patching up the worst-broken cylinder ever seen, but rather be proud of his handicraft. To this man the drilling and slotting, or chipping, keyways in pistons and crossheads, would be only in the course of a day's work, and would not be considered as a dirty, mean job.



Anchor bolts for pedestal binders

Men have drilled and chipped keyways in crossheads in one hour, and though that was away back in 1904—before the unions had educated the workers to be sorry they had been born in this country.

But this is not naming the dirtiest, rottenest, and meanest job in the shop by any means, for that job would be the handy man's job of drilling a frame and then cutting out the webs for new anchor-type binder bolts to be placed in a spliced frame, where studs are generally used when the engine comes from the maker. The illustration shows what I mean. It is not that a man might not take pleasure in making a quick and neat job, but because every time that job comes up, the boiler has just been tested and the lagging is being applied. The hot water softens up the old grease that was scraped off of the frames and other parts. It makes a mush of the asbestos lagging, and the whole mess soaks through overalls and clothes, even into the hide itself. Yes, that is the dirtiest, rottenest, meanest job in the shop; down on the edge of the pit, and under the engine in that slime and muck. No, not the job exactly, but the job's surroundings.

Some Limitations of Oil Ring Bearings

By E. G. Gilson
Research Laboratory, General Electric Co.

Why oil-ring bearings fail at high speeds—Lubricating and cooling functions of the oil—How oil-ring bearings may be made successful by correct grooving

WHEN used in slow speed bearings of moderate load the oil ring method of lubrication is an admirable device and gives perfect satisfaction. But with the advent of higher speeds its limitations become very pronounced. At first thought the reason for this is not apparent, but if we carefully analyze the situation, it is readily seen why this is so. And the analysis also shows us why there must be a limiting speed beyond which oiling by ring feed cannot be used.

A bearing must be considered as composed of three elements, the shaft or journal, the bushing or shell that the journal runs on, and the lubricant. The shaft is always chosen from considerations of mechanical design with strength usually the controlling factor and therefore is almost always a ferrous metal or alloy. The bushing may be almost anything, as there is a wide

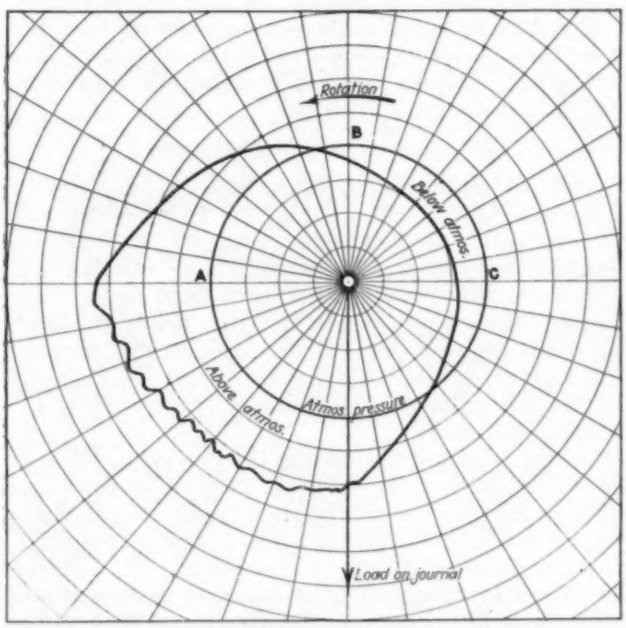


Fig. 1—Pressure distribution in oil film in a bearing

choice, but it is quite apt to be a white metal, one of the so-called Babbitts, with first cost having a large influence in the final selection. The lubricant, or oil, should be, but seldom is, chosen for its performance with respect to the other two elements of the bearing.

Now this combination that we call a bearing is nothing but a heat generator and the sole criterion to its satisfactory performance is the dissipation of its heat. In other words, if the heat is allowed to accumulate and the temperature to rise, we get increased oxidation of the oil, and sludging, with unsatisfactory performance, extending in the extreme case to failure to operate. But if the heat is properly carried away and dissipated, we have low temperatures and slow oxidation with its attendant ills, which tends towards long life for the oil and satisfaction for the bearing.

The heat is generated, of course, by friction, but not, as is generally supposed, by friction of the metals. Instead, it is by internal friction of the oil itself that the major part of the heat is developed. But the metals of the bearing do have, at a high temperature of the oil film, a very decided effect on this internal friction even though they may be separated by a perfect film of oil.

With this picture in mind it is apparent that the oil serves a double purpose, first as a lubricant, and second, as a cooler. With relatively low speed bearings the first of these is probably more important, and the other is, in most cases, not even recognized. But as the speed increases, the ability to carry away heat by means of the oil becomes of increasing importance, until at very high speeds, in a properly designed bearing, the role of cooler is by far the greater.

Rapid Replacement Necessary

In order that the lubricant may function most efficiently in this capacity, it is necessary that the bearing be designed with a full understanding of what is to be accomplished. With the greater part, one might say practically all, of the heat generated being due to the internal friction of the oil itself, it seems that the logical way to remove it is by rapidly replacing the oil film. This can be done only by forcing large quantities of oil to flow through the bearing, and so breaking up the surface that only a small portion of the oil is worked in the film for a very short time, and then immediately passes into a large volume of comparatively cool oil. This has the advantage of removing the heat at its source of generation and, therefore, keeps the temperature of all the parts low.

The two factors most seriously influencing this oil flow are: First, the oil ring, and second, the grooving of the bearing. Obviously, the oil must be carried from the oil well to the point where it enters the bearing, and to do this is the sole function of the oil ring. At first glance this device seems ideal for the purpose, starting to turn and therefore carrying oil with the first movement of the shaft, and increasing speed and so the amount of oil carried with increasing revolutions of the shaft. But in practice the performance is not so perfect. Slippage on the shaft is great, so that while the ring may start turning with the shaft and increase with it for a short time, a speed is soon reached where

there is practically no further increase with shaft speed, but even an actual decrease and a possibility of absolute stopping of the ring. Furthermore, the oil carried by the ring is only that which clings to it as it passes through the oil well, and as the speed increases, centrifugal force tends to throw this oil off. This action is so effective that the only oil coming into contact with the journal is that carried on the inner face of the ring. This amount, in a given case, depends on the surface tension of the oil. The point of contact is, of course, between the inner face of the ring and the top of the journal. Therefore, all the oil must be squeezed off the ring before it reaches this top point. And this point is about 90 deg. ahead of the end of the oil ring slot where most of the bearing grooving systems start. It is thus seen that the ring does not deliver the oil to the bearing at the entrance to the ordinary grooving system. On the other hand, starting the grooving on top, at or near the point where the oil is squeezed off the ring is not effective, as the oil will not enter the bearing at this point. This will be explained later.

Thus it is seen that the oil must travel approximately 90 deg. from its point of delivery by the ring to get to the entrance of the grooving system. It can only do this by gravity flow or by being carried by the journal. There is a tendency for that carried by adhesion to the journal to be thrown off by centrifugal force. Observation clearly shows this, and it also shows that most of the oil that does reach the entrance of the ordinary

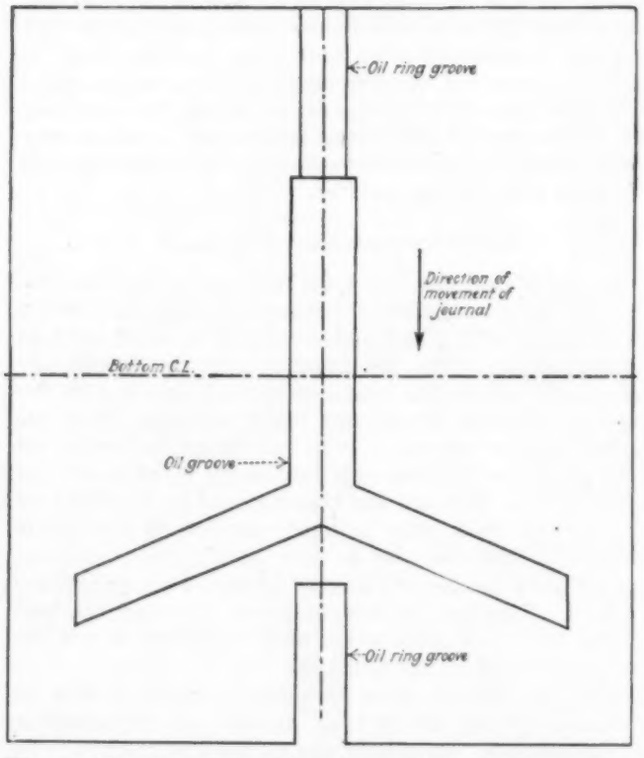


Fig. 2—Development of bearing, showing oil grooving for taking advantage of low pressure area split on top and opened out flat

grooving system does not go into the bearing, but simply piles up at the end of the ring-slot and flows down over the ouside of the shell, or bushing. There are two reasons for this: the first is the centrifugal force imparted to the oil caused by coming in contact with the journal, and the second and main reason is, that at this point, the oil film pressure is greater than the atmospheric pressure, so that the flow due to pressure differences should be out of the bearing instead of into it. This means that the only oil entering the bearing under this condition is that due to its adhesion to the moving parts. For low speed bearings this is

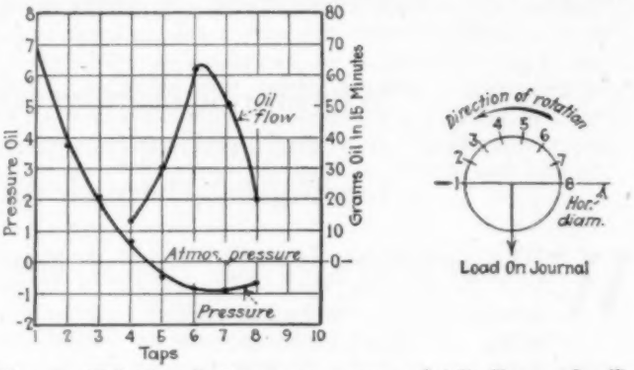


Fig. 3—Relation between pressure of oil film and oil flow in bearing

sufficient to supply lubricant, and the heat generated is principally dissipated by conduction through the metal parts. But, when we increase the speed, and perhaps also the load, so that we are depending on the oil flow through the bearing as a cooling medium, this amount is not adequate and means must be found for increasing the quantity of oil entering the bearing. Fortunately, a diagram of the pressure distribution in the oil film about a journal usually shows a small region where the pressure is below atmosphere. If this region can be connected up to the oil delivered from the oil ring, the difference of pressure should cause the oil to flow into the bearing. Usually this can be done, and when it is done, the results are surprising.

Position of the Oil Groove

A typical pressure distribution chart taken from an actual bearing is shown in Fig. 1. This bearing was 2 in. in diam. by 5 in. long with the load applied vertically downward. The direction of rotation was as shown by the arrow and the speed 1,000 r.p.m. This diagram shows zero pressure near the top of the bearing, increasing quite rapidly to a considerable pressure at the point *A*, which is the end of the oil ring slot and the beginning of the ordinary, commonplace oil-grooving system.

Nothing is gained by starting the grooving system at the top of the bearing at *B*, as mentioned above, for although the pressure may be slightly below atmosphere, it is not enough to affect the oil flow, and it too quickly enters a region of fairly high pressure. If, however, the oil pouring down on point *A* can be carried around to the sector of low pressure between *C* and *B*, it will be found that it will be drawn into the bearing and the difficulty will then be to carry enough oil to the bearing with the oil ring.

An example of a type of grooving for doing this is shown in Fig. 2. Here the oil groove is carried from the end of the ring slot down under the shaft to a point just below the opposite end of the ring slot. Here it branches, spiraling upward toward each end of the bearing and ending about 30 deg. above the horizontal diameter. Only enough space is left between the end of the ring slot and the branch, and at the ends of the groove, to form a seal. This particular grooving is very

effective but, of course, applies only for one direction of rotation of the shaft.

The effect of admitting oil to a bearing at a point of low pressure is shown very strikingly in Fig. 3. This was an experimental bearing 2 in. in diam., 5 in. long, load applied vertically downward and run at 1,000 r.p.m. The pressure distribution of the top half of the bearing was taken at eight different points, as shown, one and eight being at opposite ends of the horizontal diameter and the others equally spaced between them. The oil flow was taken by admitting the oil at a constant pressure of 5 oz., in turn, at the different points and weighing the amount flowing from the ends of the bearing during a period of fifteen minutes. No oil would enter at points, 1, 2, and 3 as would be expected from the pressure curve. At point 4 a slight amount flows through the bearing, although the pressure is above atmosphere.

This occurrence is probably due to adhesion to the rotating shaft. But as the pressure drops below atmosphere, the flow increases very rapidly and reaches a maximum around points 6 and 7 dropping off rapidly again at 8. Just why the flow should fall off so rapidly at this point (8), with the pressure still below atmosphere, as shown by the pressure curve, is difficult to explain. It is probably due to the fact that the point of zero pressure is not sharply defined so that there is a good deal of "overlapping" in this vicinity. This is also probably true for the region about *B* in Fig. 1. But the fact remains that the oil flow does drop off here, and as we go beyond point 8 below the horizontal diameter, the flow stops entirely.

Finding the Low Pressure Area

This region of low pressure in a bearing is a real thing and the pressure difference may be of such magnitude that it can be utilized to pump oil directly from the oil well into the bearing. This has been done. Unfortunately, it is very difficult to apply this practice on account of the uncertainty of the location of the low pressure area. It seems to be about 120 deg. in the direction of rotation beyond the point of nearest approach of journal and shell. And the location of this point of nearest approach is probably influenced by many things, such as viscosity of the oil, magnitude and direction of the load, speed of rotation, etc. But when we try to take advantage of this low pressure region in an oil ring type of bearing, it is apparently not necessary to locate it so accurately. For it has been possible to make bearings that were practically inoperative give very satisfactory service by simply roughly locating the region of low pressure and then grooving them accordingly.

Dissipating the Heat

Of course all this amounts to is removing the heat from the interior of the bearing as fast as it is generated instead of allowing it to accumulate and build up high temperature. The heat must be dissipated and it is presumed that the radiating surface is ample for the purpose. This rapid removal of the heat by means of a large flow of oil will then serve to keep the temperature low. The result is much retarded oxidation and consequent sludging of the oil with greatly increased life before renewal is necessary. In fact, by taking full advantage of the possibilities offered, bearings can be operated over a long period of time without any noticeable deterioration or sludging of the oil.

Step Bearing Design—Discussion

By Nelson Ogden
Works Engineer, Kingsbury Machine Works, Inc.

There was a reference, in an article on step bearing design, on page 514, Vol. 63, of the *American Machinist*, to the Kingsbury thrust bearing that, perhaps, tends to convey a wrong impression which I desire to correct.

The statement that care must be exercised in starting and stopping the vertical Kingsbury bearing, is, I believe, an echo of an initial belief that it was desirable and even necessary to bring the bearing up to speed as rapidly as possible, and to stop rotation quickly.

While it is true that the oil films are thinner at low speed than at normal speed, abundant operating experience has demonstrated conclusively that the bearings can be started and stopped in whatever way may be most convenient and without any fear of damage.

The Kingsbury bearing was first applied to vertical water-wheel generators in 1912. Operation was satisfactory from the beginning. Additional installations were soon made in the same plant and at several other important stations. In those early days there were some cases of trouble, due to wiping of babbitt surfaces when starting up.

This lead to the idea that the surfaces were always in some danger at very low speeds, and as a result certain operators made a practice of jumping their machines up to speed and stopping suddenly with air brakes. However, as experience accumulated, it became clear that the wiping was not due to low speed but occurred because of inaccuracies in bearing surfaces.

It was found that these surfaces in certain machines would became roughened through the action of stray electric currents, sometimes resulting in serious damage. This trouble was prevented by providing complete insulation for the stationary elements of the bearing. In certain other cases, the original surface of the revolving element was not made sufficiently smooth and flat. Improved methods of finishing bearing surfaces, together with careful insulation, resulted in complete reliability under all operating conditions.

A series of tests made in 1919 demonstrated the indestructibility of the Kingsbury bearing even at very low speeds. The results were published in the *Proceedings* of the American Society of Mechanical Engineers for 1919 ("Slow Speed and Other Tests of Kingsbury Thrust Bearings," page 685). Long runs were made, at pressures up to 1,000 lb. per sq.in. and at speeds down to ⅛ r.p.m.

These runs were practically a series of starts and stops in rapid succession, or what might be called chattering. The friction coefficients increased rapidly when the speeds approached zero, indicating plainly that there was metallic rubbing. In short, the conditions purposely established were those most likely to damage the bearing surfaces.

It is significant that in every case the enforced running at very low speeds actually improved the surfaces, as was evidenced by a decrease in the friction coefficient each time a given test was repeated. In spite of the high friction, heating was at all times negligible, owing to the low speeds.

Today, with over 500 bearings of all sizes in vertical hydro-electric service, starting and stopping under load, operators are plainly told in printed instructions that they can run their machines in any desired manner, without fear of injuring the bearing surfaces.

An Investigation Department in a Typewriter Plant

By B. J. Dowd
Factory Superintendent, Royal Typewriter Co.

IN THE very large manufacturing plant it pays to have separate departments with more or less complete staffs of experts and assistants to take care of such matters as research, time-study, standardization, testing, etc. The amount by which these departments increase the general overhead is inconsiderable when spread over a large production and the savings they can accomplish far more than offset the sums they spend.

Only a very large plant, however, has an output sufficiently large to stand the burden of individual departments devoted to these various functions. The small plant can hardly afford any work of this nature while the medium large plant can support a modest staff of specialists. The superintendent of the small plant is supposed to know all that is necessary for the conduct of his shop and to find time somewhere to do any investigating that may be required to supply any deficiencies in his supply of experience.

A Force of Experts

A system for taking care of the various functions mentioned is in successful operation at the Hartford plant of the Royal Typewriter Co. Grouped in a unit known as the Investigation Department are a half-dozen men who are an auxiliary to the superintendent's office. Questions that cannot be answered offhand are referred to the chief of this department who assigns some one of his men to obtain the necessary information. The Royal plant can fairly be classed as one of medium large size and the investigation department plan in use in it should be of equal advantage in other plants of somewhere near the same capacity.

The personnel of the department is chosen from the regular factory force in line with the company policy of filling vacancies by promotion. Expert mechanics who show particular aptitude for research and investigation are desirable recruits. During the life of the department there has usually been a chemist on the staff. Such jobs as the test and analysis plating solutions and the application of the standard salt-spray test to plated or japanned surfaces to determine the durability of the finish naturally fall in his field.

Constant Study of Systems

First in the order of work done by the investigation department is a constant study of the existing systems, methods and conditions throughout the plant with a view to revising them or replacing them if necessary by better ones. As a general thing the starting point in this work is indicated by suggestions or complaints originating with the various department heads. Other leads are found by the investigators themselves in the course of their work.

A second big job assigned to the investigation department is the drawing up of standard factory instructions. This is one of the jobs that is never finished as methods are constantly being revised and the corresponding instructions with them. Much thought has been put on these instructions and the result is a file of classified production knowledge that is independent of human memories. Closely allied with standard instructions is the routing of operations which involves the issuing of notes, the filling out of requisite cards, etc.

Investigation of piece-work operations and prices and the carrying out of motion and time studies is a very important duty performed by the investigators, as this is the phase of investigation work that brings them into contact with the employees. By showing the employee being studied that the company wants to be perfectly fair in setting prices, the investigator helps maintain the factory morale. Often, due to various changes or conditions, it is necessary to adjust the piece-work prices or change the methods of operations that impose a heavy physical or mental strain.

Records of Machine Operation

The department is also charged with the task of analyzing machine requirements for all machine operations and employee requirements for all departments. It keeps records of all operations in which machines or tools, or both, are involved, the cards showing lists of the tools on the front and of the machines on the back.

As already mentioned, tests and experiments having to do with processes or materials employed in the factory are conducted by investigators. Considerable reductions in costs have come from work of this nature. Each week a condensed report of the departmental activities is made for the factory manager and the superintendents' office. Cost comparisons between old and new methods are constantly being made. New methods usually are accompanied by a reduction in production costs with quality always maintained or bettered. Through comparison with similar operations it is often possible to predict costs of new methods long before the work has reached the point where the cost department can report the actual figures. This is done when a cost estimate is needed.

A great many standard containers and tote-boxes have been designed to protect finish and facilitate the handling of the many small parts that go into a typewriter. Keeping a record of these containers and ordering new ones as needed is up to the investigation department. New designs are developed in consultation with the wood-working department.

Standardized Forms

Finally there is the matter of printed forms for the various factory departments. Instead of permitting each department to design its own forms and thus piling up a large number of forms, unrelated as to size, ruling or arrangement, the whole problem is turned over to the investigation department with eminently satisfactory results.

Accurate records, readily accessible, are an essential requirement in a successful investigation department. Such a department cannot succeed unless it has the fullest co-operation of executives and heads of all departments. The first requisite of any investigation department to secure and hold confidence is a force of men with ability, tact, personality and experience.

The foregoing statements will give some idea of the many and varied problems that can be turned over to an investigation department. With the right man in charge and the right kind of men to assist him it is surprising what valuable returns can be achieved from a relatively small expenditure.

Automotive Production

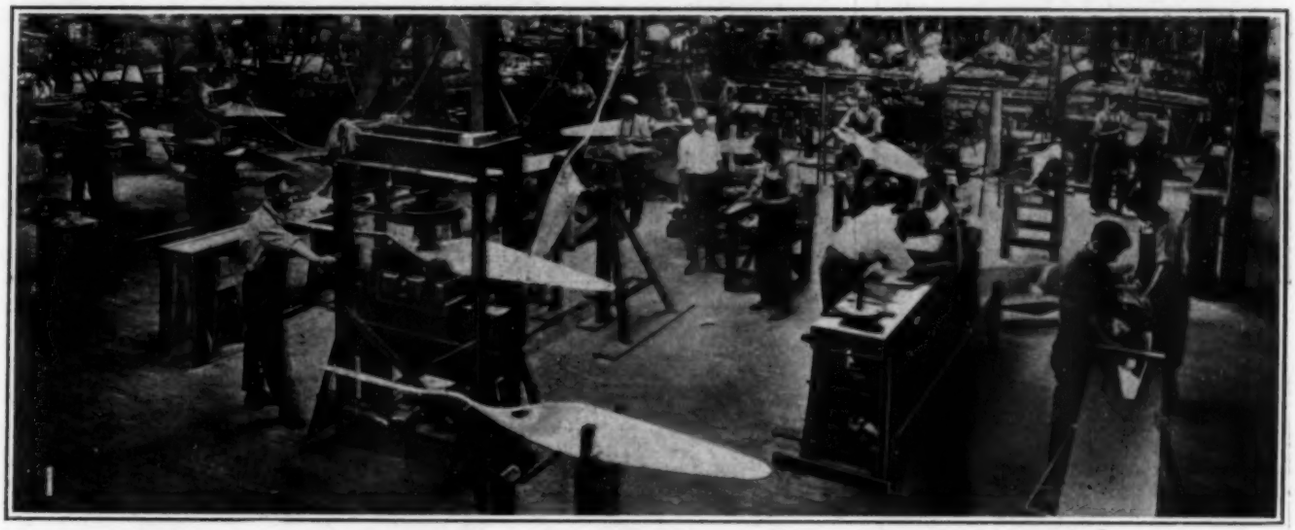


Fig. 1—General view of propeller department

How Curtiss Makes Metal Aircraft-Propellers

By Fred H. Colvin
Editor, *American Machinist*

An outline of the methods used in making the Reed propeller—Sawing, milling, twisting, boring, mounting the hub, and balancing ready for use

IT IS a far cry from the crudely shaped propellers used on the early airplanes to those of the latest design and workmanship, even of the modern wooden propeller. But just as wood is giving way to metal in plane construction, so the same tendency is bringing the metal propeller to the front. There have been many attempts to replace wood with metal or even other substances, such as Bakelite. The Curtiss-Reed patented propeller, now being made by the Curtiss Aeroplane & Motor Co. at its plant in Garden City, L. I., N. Y., seems to have overcome the difficulties previously encountered.

The number of propellers demanded for any given size is not yet sufficient to warrant the use of high production machinery on this work, but several special machines have been devised for some of the operations. The advantages of the metal propeller are being appreciated, however, and the demand is growing so that more machinery will be needed. Eighty-seven aeroplanes were flown in the recent Air Meet at Mitchell Field. Fifty used Curtiss-Reed duralumin propellers, among which were all the high speed ships.

The Curtis-Reed propeller is made from a slab of duralumin, the ends being thinned down by rolling, as can be seen both in the general view of the propeller department, Fig. 1, and in Figs. 2, 3 and 4. One of the first operations is to trim the ends to approximately the desired shape, on the bandsaw in Fig. 2, the shape of the blank after sawing being clearly shown in Fig. 3. Then the exact shape desired is laid out from the templet as in Fig. 4, the templet being reversed for scribing the outline on the other end. Great care is taken to have the propeller symmetrical as this affects the balance, which is an essential factor in the finished propeller. Lines are scribed across the propeller at regular intervals to assist in checking the twist or pitch. The edges of the blank are thinned and curved by the formed milling cutter in Fig. 5, the work being done on a knee-type milling machine. The ends are also tapered as may be seen in some of the other views.

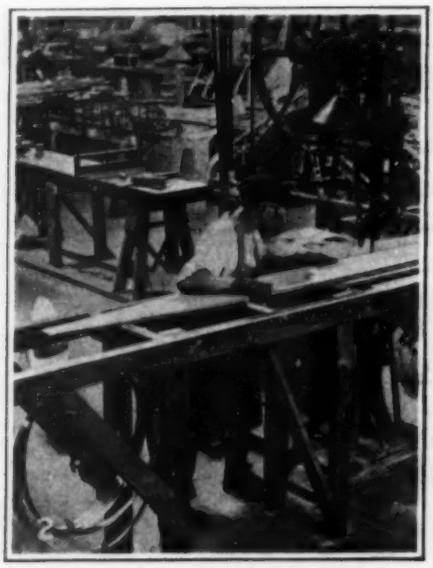


Fig. 2—Cutting a propeller from a blank. Fig. 3—A blank ready to be laid out

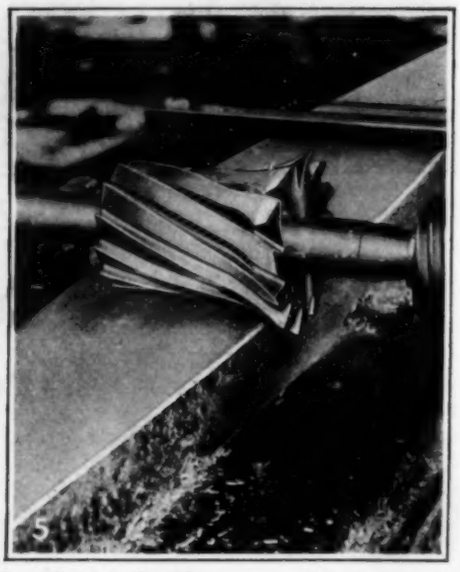


Fig. 4—Laying out the propeller. Fig. 5—Milling the edges and ends

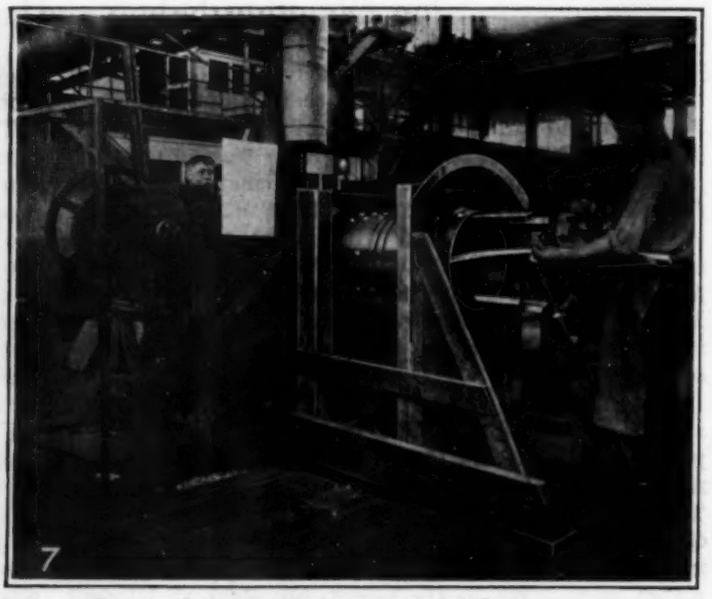
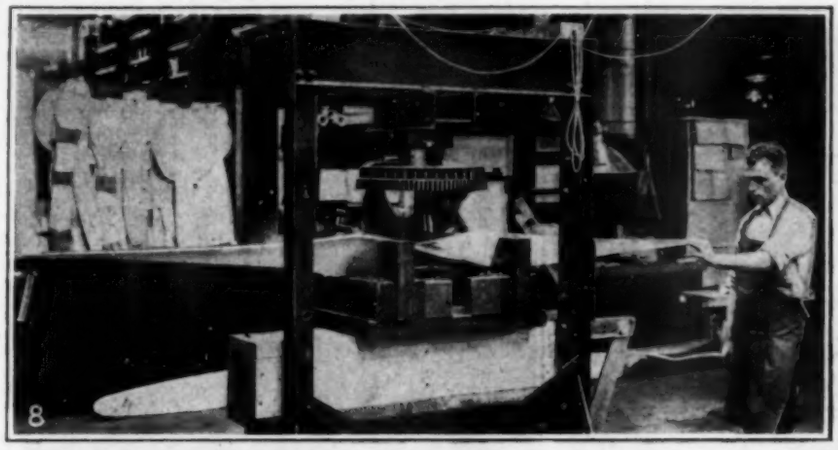


Fig. 6—Machine for twisting the blades. Fig. 7—how the blades are twisted

AUTOMOTIVE PRODUCTION



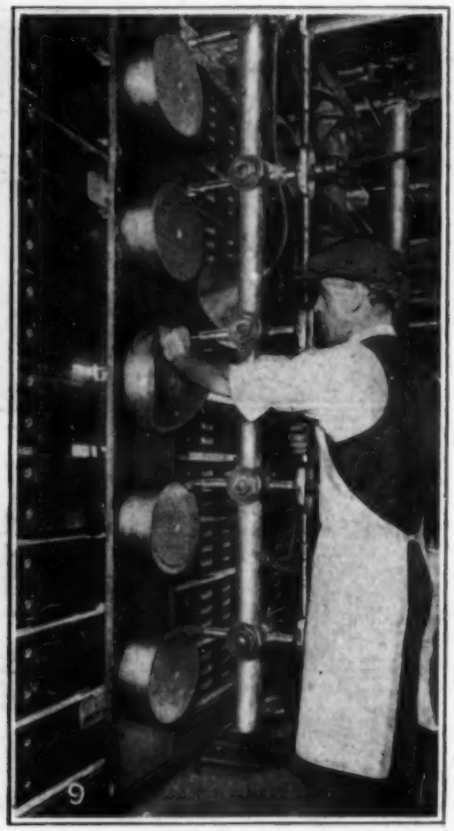


Fig. 8—Straightening blades after twisting. Fig. 9—Roughing out hub-blocks
Fig. 10—Grinding for hub-blocks

The blank is now ready for twisting and this is done in a machine designed especially for this work, as shown in Figs. 6 and 7. The machine grips the blade in the center and holds it stationary. Then the movable jaw is moved to one of the lines scribed across the blade and the blade twisted a given number of degrees. At each successive point the proper twist is given and the angles measured as the work progresses. Great care is taken to get the desired angles on the blade at different points, since the correctness of the twist, or lead of the air-screw, is a very important factor in its efficiency.

After twisting, the ends are trimmed and the blade is ready for straightening, as in Fig. 8. The straightening is done by a press equipped with angles and channels, suitable blocks being provided to hold the blade in different positions so that any bends or irregularities can be removed by applying pressure.

For holding propellers on engine shafts equipped with hubs for wooden propellers, hub blocks built up of laminated wood are used, as shown in Fig. 9. It will also be seen that the multiple engraving machine, originally designed to shape wooden propellers, has been adapted to the forming of the hubs to suit the metal blades. With the master hub, or former, in the center, four half-hubs are formed at once, giving two complete hub blocks at each set-up of the machine.

In the meantime, the blade is smoothed up and finished by a portable grinder, using it as shown in

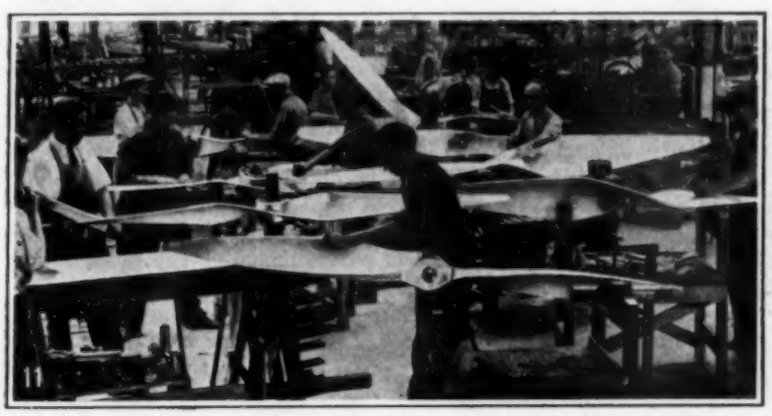
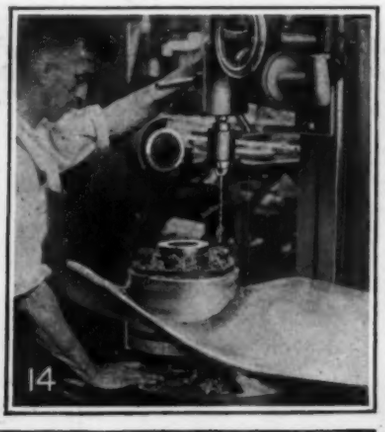
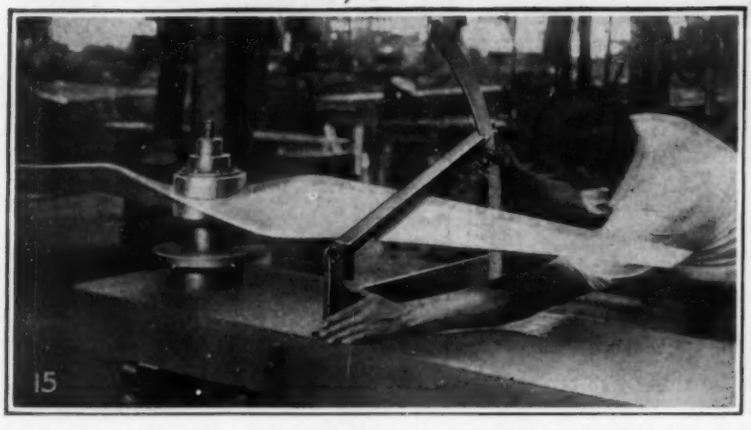


Fig. 11—Finishing blades by hand. Fig. 12—Fitting the hub-blocks

AUTOMOTIVE PRODUCTION





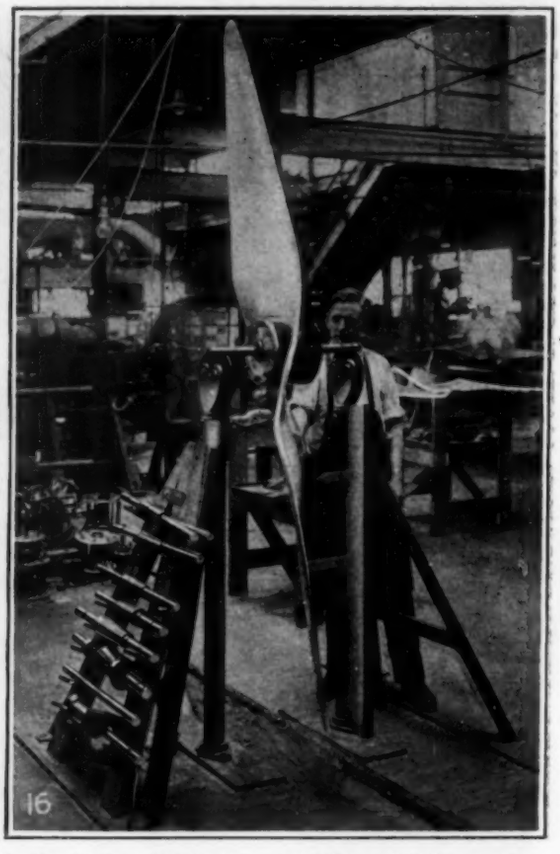


Fig. 13—Fitting a hub-block in place. Fig. 14—Drilling the hub-plate holes. Fig. 15—Checking blade angles Fig. 16—Balancing and testing the tracking

Fig. 10, and also by hand. The wheel is driven by a flexible shaft from the motor at the left and is easily handled by the operator. This view also shows the scribed lines on the blade, both the cross lines for angles and the center line for testing straightness. Fig. 11 shows the hand finishing of the blades, both files and abrasive paper being used, as by the two men at the left. In the foreground is an experimental propeller of forged duralumin.

The hub blocks are then fitted to the propeller, a hole being bored to fit over the dummy hub shown in place in the propeller on the bench in Fig. 12. The hub bushing used in the complete propeller is splined for the fit on the engine shaft, and supports the propeller so that it can be driven by the engine. The final fitting is shown in Fig. 13, after which the two half-hubs are clamped in the drilling fixture, Fig. 14, and the hub and blade drilled as a unit for the permanent hub mounting.

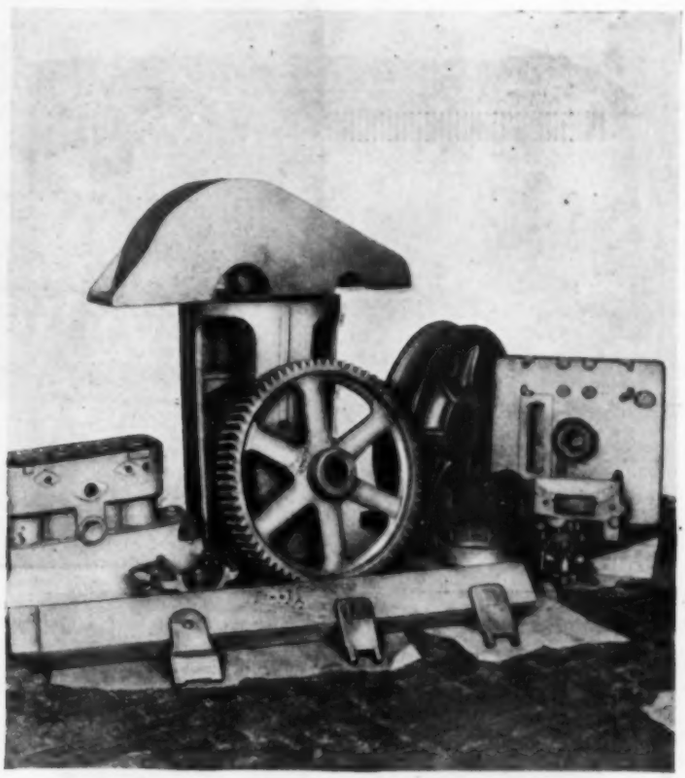
After the hub and retaining flange have been bolted in place (and this mounting must be very secure, since the propeller does all the work of pulling, or pushing in some cases, the plane through the air) the propeller is mounted on the test bench shown in Fig. 15 and the angles of the blades very carefully checked at the various points scribed across the face. The cast-iron bench is also scribed at corresponding points to aid in setting the gage.

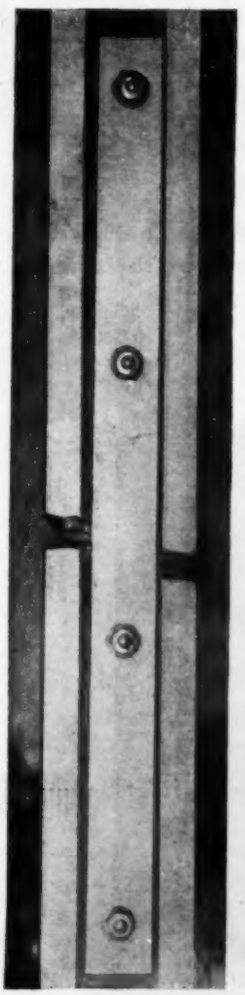
Next comes the balancing of the completed propeller as in Fig. 16, rollers being used for supporting the shaft. This method is the same as for wooden propellers. At the same time, the "tracking" of the blade is noted by means of the pointers shown on the right-hand support. The pointers can be adjusted for various propellers and show how much the two ends of the blade differ, if at all.

Unlike wooden propellers, these propellers are free from dangers of splintering through striking material that is swept into the blades from the ground, nor can they be affected by rain, hail or quick-temperature changes. A wooden propeller can seldom be repaired after injury from rough landings, while the Curtiss-Reed propeller can be straightened and used continuously. Its greatest advantage, however is found in the added performance given to the airplane, which is roughly six per cent in both speed and climb.

Curtiss-Reed propellers are now available for practically every size and type of aircraft, ranging as they do from the little light plane with its motorcycle motor, on through the 150-hp. commercial plane to the 600-hp. pursuit and racing plane and to the 700-hp. heavy-duty ship. They weigh from a quarter to a third more than the old style wooden propeller. But in spite of this additional weight the performance of the plane is improved as stated above.

While wooden propellers have stood up remarkably well under adverse conditions and the glue makers have developed an adhesive that seldom fails to hold the laminations, the use of metal is in keeping with the trend of the times in nearly all lines of manufacture.

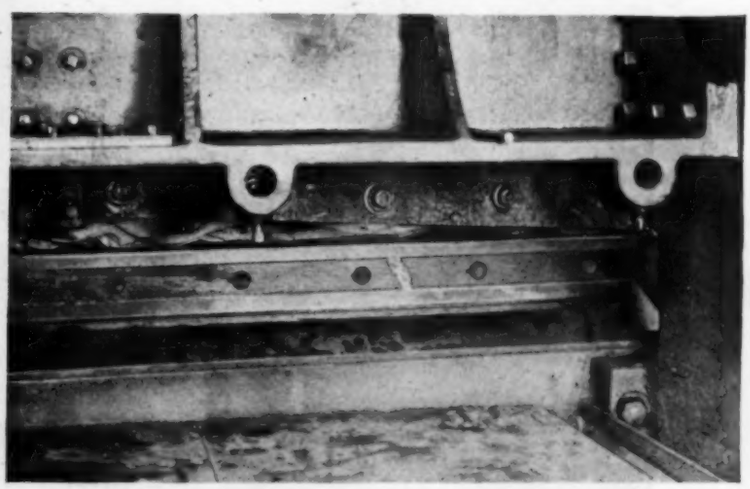


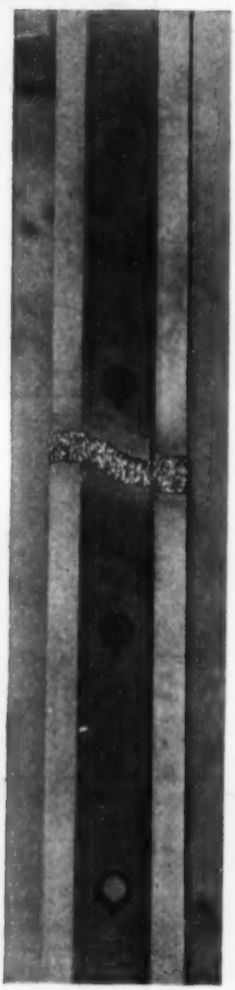


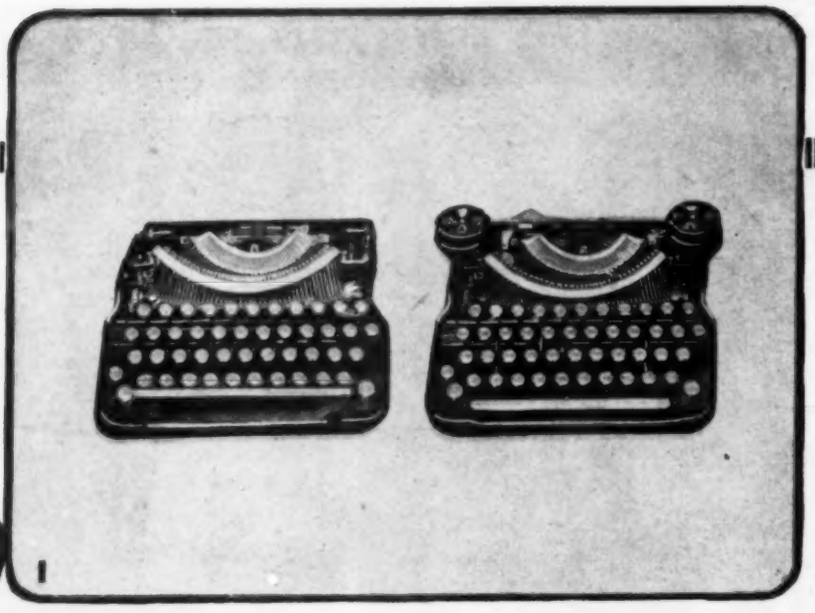
Arc Welding
as a
Salvaging Medium

At the left above is part of a pile of foundry flasks salvaged by arc-depositing metal in the worn flask-pin holes. At the right is a miscellaneous group of salvaged castings. A broken shear blade is shown at the left tied together ready for welding. At the right is the arc-welded repair. The blade in place in the shear frame appears below.

Photographs by courtesy of the Westinghouse Electric & Manufacturing Co.





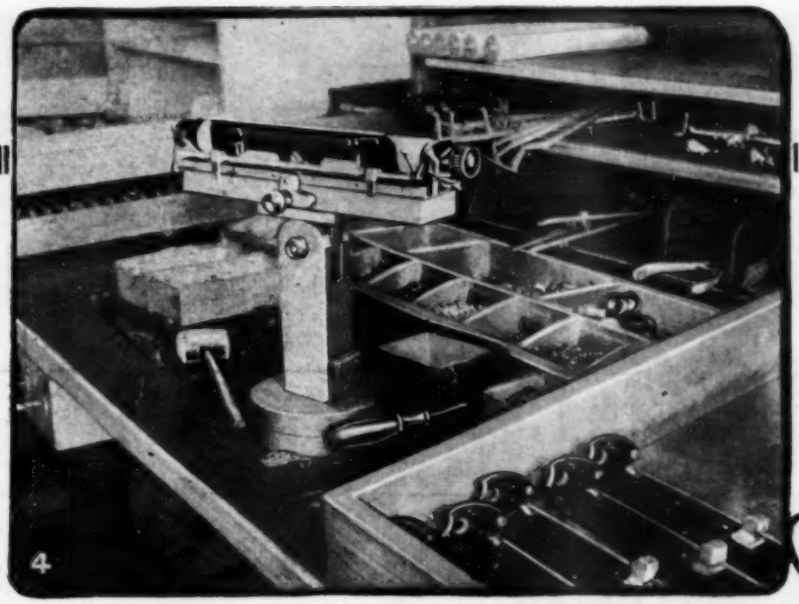


Assembly Work on a P

1—Two steps in the main assembly

2—Soldering fixture to locate and secure the type in exact position. The type is registered in the index wheel, and its bar is swung down from its jigged position above. The torch is hinged down by a treadle. Wire solder is fed from a reel

3—A row of completed machines in their cases awaiting removal of the final inspection cards



a *Portable Typewriter*

4—The final sub-assembly on the carriage

5—One of the carriage jigs hinged down to assist the worker.

6—A carriage sub-assembly ready to receive the roll. Each jig is designed for certain operations that have been divided, as to time required, to maintain an even, balanced flow to the main assembly stations

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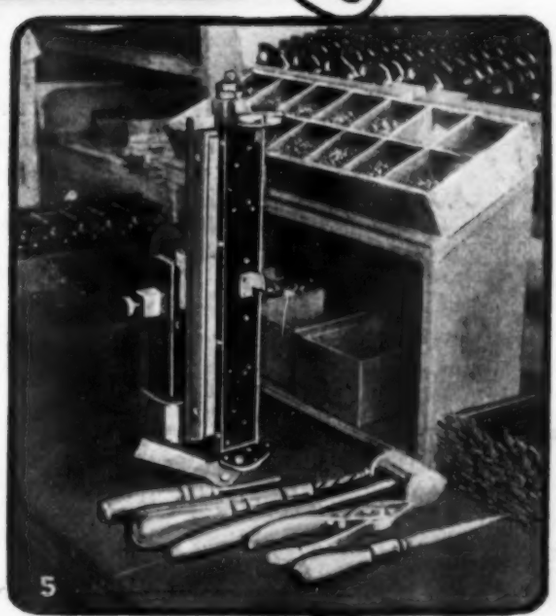
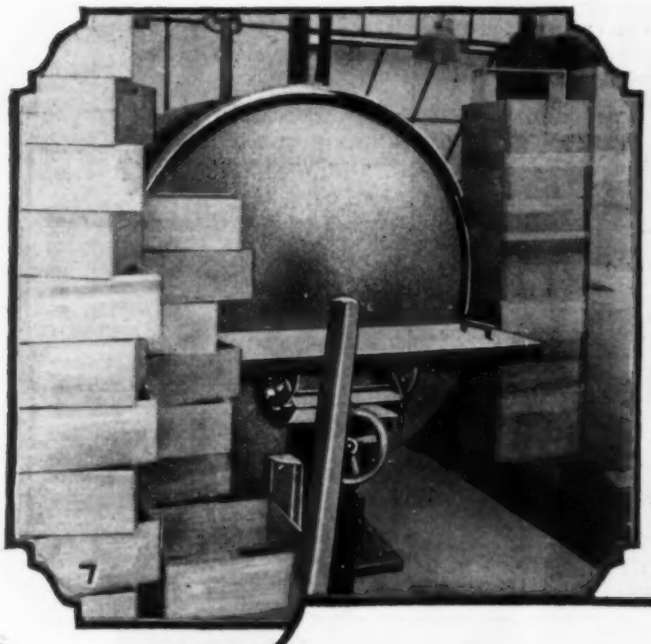
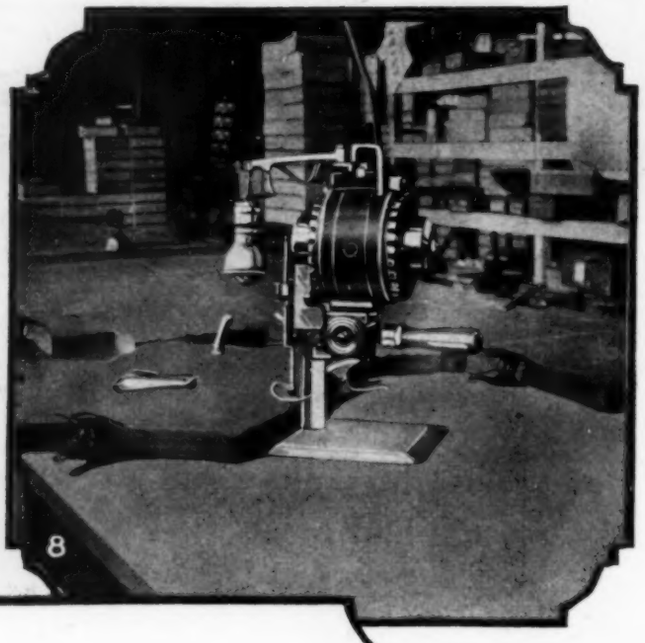






Equipment Used on the Case

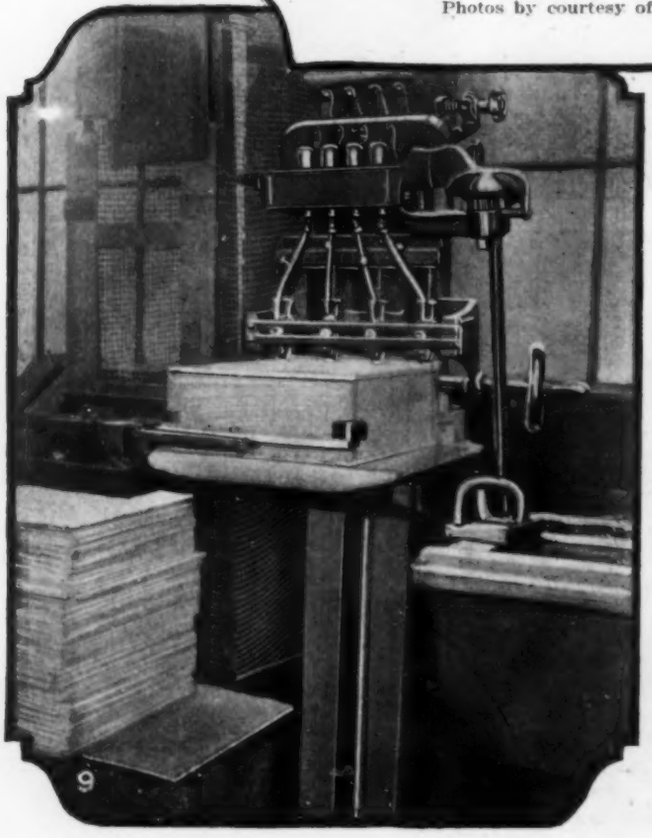
7—A double-disk, 52-in. sander

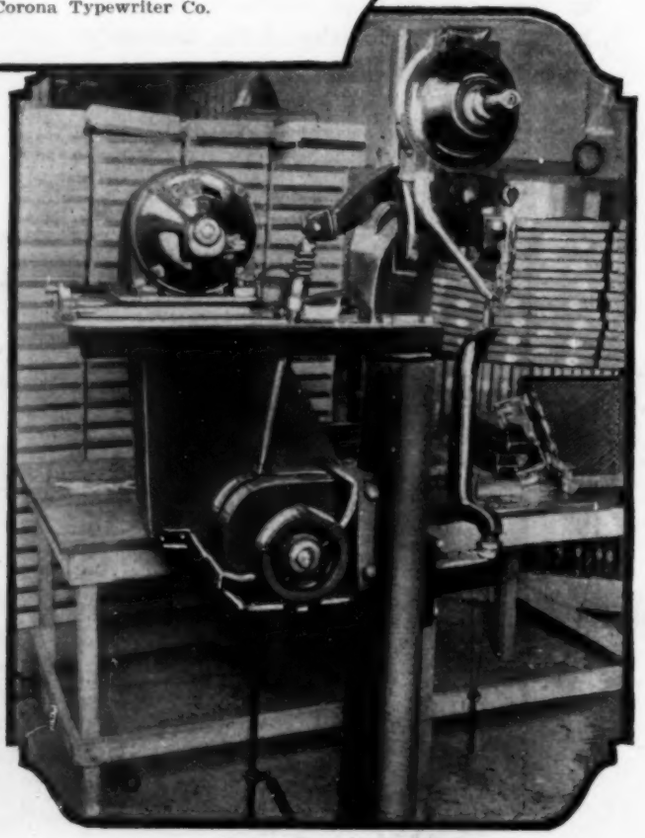
8—The cloth-cutting machine

9—A four-spindle nailing machine

10—A split-rivet driver for the fittings

Photos by courtesy of Corona Typewriter Co.





John Dick Visits a Machine Tool Works

By F. M. A'Hearn

Jim Kelly shows John Dick and Bill Weston machine tools in the making — Making machine tools give service — Machine shop accuracy

BILL WESTON was considering the purchase of some new machine tools for the Coaltown and Great Western R.R. shops at Coaltown. Bill was not ready to buy tools, not even read to make a list of the tools he would need first, but he was considering. The machine tool catalogs were studied, of course, but they could not talk to Bill as man to man. They could not tell him why Jones of the X. Y. & Z. purchased one machine for a certain purpose while Jackson of the B. V. & D. bought a different type of machine for the same work. Bill needed a friend.

"Now there is Jim Kelly," said Bill to himself. "If I had a half hour with Jim he would tell me exactly what I need to know." After he had gotten Jim Kelly, the funeral director, on the wire by mistake, Bill finally heard the welcome voice of Jim Kelly, the machine tool man.

"Bill, come down to the city, bring John Dick along and leave the management of the C. & G. W. shops and the Dick Pump Works to the staff for a few days."

John was not hard to persuade. The plans were soon completed, both Bill and John gladly looking forward to a visit with Kelly. They made an early start on the day chosen for their trip to the city and found Kelly cleaning up the morning's correspondence. After Kelly had performed his duty in extending a proper welcome to his guests he anticipated Bill's attempt to open the discussion of new tools for the C. & G. W. shops, by telling his friends the plans for the day.

"Fellows," said Jim, "The works are putting out an order of special machines for an automobile plant; they will run the first one today and I wish to see the performance. While we are there you will both see in the process of manufacture some of the latest tools such as you have purchased. I feel that benefit will accrue to all of us and Bill will be better enabled to choose the tools that he must sooner or later obtain. We also can show him tools now under construction that have been ordered by some of the other railroads."

While driving over to the plant, the conversation turned to machine tools, their cost and life. Bill asked why it was that while tools were being built heavier and stronger, you saw so many inquests over the remains of machines dissected and damaged. Another point that John and Bill both agreed upon was that machine tools cost like thunder. They were made of the same materials as were locomotives and steam pumps, and the men employed in their manufacture were principally machinists. Why the costs?

Kelly's answer was that the visit to the plant would to a certain extent answer their questions. As to cost, some tools appeared costly when purchased, but if given fair usage, were cheap in the end. A railroad might purchase fifty new locomotives of one type in a single lot, but did not buy planers, lathes or other tools in similar quantities. Neither did the growth in size of the locomotive ever stop. Machine tools must follow the pace set.

Entering the shop, the party passed through the erecting bay. They stopped in a section where several vertical boring mills were being erected.

"There, Jim," said Bill Weston, "That is a tool I want. What swing is that mill?"

"Ninety inches," was the answer, "What line of work do you want it for?"

"What line of work? Why boring mill work, of course. A general line, wheel centers, front bumper casting to bore for column bearing, driving wheel tires, and—"

"Wait a minute!" Kelly interrupted, "Tires and wheel centers? That means mostly tires. Right? About what percentage of the work would be tires?"

"Oh, half or more. Yes, possibly two thirds," was the answer.

"Two thirds of the work is tire jobs," was Kelly's comment. "That mill is a standard machine, not a tire mill."

"Don't want a tire mill," replied Bill. "The C. & G. W. is not operating a locomotive works but a repair shop. We are not big enough to require a special machine for each job."

"You stated a while ago that you saw machines held up for repairs more frequently than years ago." said Kelly. "Correct. In the first place the power-

BILL WESTON thought that machinery was not as sturdy as in former days. It was rather costly, too, when compared to his locomotives, but Jim Kelly showed him why. Machinery is built, to a large extent, in small lots or even one at a time, and the designs change so frequently that the cost of the scrapped fixtures mounts up. Bill Weston's visit to the plant of Kelly was a revelation of careful construction and accuracy in assembly.

absorbing capacity of high-speed steel is way beyond that of carbon steel. Therefore, the machine operates under a greater load. Again, a motor-driven tool is not protected by belt slipping as was the belt-driven machine. Another point is that the quality of the mechanics has been lower since the war and railroad strike, and last but not least,—with a sly wink at John,—standard machines are sometimes expected to turn out heavy-duty production. I can give you at least one incident of the error of wrong selection.

"The X and O shops purchased a standard mill of a well-known make several years ago. A new foreman tried to keep up-to-date and so introduced the piece-work system which was in operation in a neighboring shop. By their schedule his boring mill should bore a tire per hour and turn demounted tires at the rate of three per day.

"Under the new system things generally were going well, but the new mill gave trouble. One day I dropped in when the machine was undergoing repairs. The shop superintendent was not overly pleased with the performance of the machine and I felt that a heart to heart talk was needed. I told him that I was glad that it was not our machine and that I would rather miss a sale than see one of our own tools put in a shop and shown up in a bad light by wrong usage. Also, since I knew the machine used in his neighbor's shop, I told him that while the swing was the same, the other machine was a heavy one. When they cut down the output to a reasonable rate they had no more serious trouble. Now if you install that machine and try to duplicate the performance of an extra heavy, you may as well know in advance that you are due for a disappointment. Were it otherwise, we would not need to build the heavier machines.

"We will not criticise your operators, Bill, it's your own business to know their ability or shortcomings. Might be well, however, to mention one thing to you. When you are told that the big planer is out of business for repairs, do you make sufficient inquiry to enable you to know the true cause? Do you know whether the builder's design or workmanship is at fault or whether your own force is entirely responsible for the damage? Or is it possible that you see only the machine stopped, the work delayed, and decide off hand that you will have no more planers of that make?

Discovering a Hoax

"You know, Bill, such things really do happen? I had a case of that kind not so long ago. A new planer wrecked the feed on the right-hand cross-rail head. The operator fell asleep. The head fed up against the left head and stopped. We were called but not advised as to the cause. The story was that the feed let go just as the tool finished the cut. The operator loosened the job and moved it and also ran the left-hand head a foot or so out and away from its position at the time of the accident. Not a bad job of covering tracks. When our man arrived, the right-hand head stood as it had when the break occurred. When he found that the head moved freely on the rail he smelled a rat. The odor was more pronounced when he measured from the left head to the marks in the oil on the cross rail, showing where the left head last stood, and found that it had been mighty close to the last position of the right head. To clinch the matter, he found the imprint of the feed lever pin on the side of one saddle and the bruised pin head in the other saddle. His findings brought out the true story. I tell you this because I feel, Bill, that you have a suspicion that machinery is not so well built as it was when you worked as a mechanic. We have tried to keep up with the march of progress and to build tools more carefully and accurately than they were built during the last century."

John agreed with Kelly, but declared that he failed to learn, during the conversation, the reason for the

The official inquest

high cost of castings that were sold in the form of a machine tool instead of a locomotive or a concrete mixer. Particularly the large machines. "How come?"

"Fair question." answered Kelly. "The answer reads like this. In addition to requiring a very accurate finish, machine-tool castings must be as free from defects as it is possible to make them. There is no chance to scrap a tooth in a gear blank. The whole blank goes. A customer would object to a bad spot planed up in the top of a lathe bed.

"Another costly item is the variety of fixtures used in making our machines. Remember, too, that while Bill might have a couple of hundred locomotives on his line, he would have one lone wheel lathe to handle the tire turning for the entire lot. His new wheel lathe runs only part time. Fat chance to build another wheel lathe for the C. & G. W. R.R. When locomotives change, the tools change. Altering a machine means scrapping the fixtures. When John makes a drawing or pump pattern for a customer he charges him for it. He doesn't blush over the matter either, but still wonders why machine tools are costly."

In the erecting bay Jim halted before a boring mill bed that was being leveled preparatory to setting the housings. Heavy cast iron bars had been set over the pit to support the bed casting. Wedges at frequent intervals between the bars and the bed casting served to bring the bed level. One man was tapping a wedge lightly with his hammer while another tried a level on the upper surface of the frame. A hand signal and the tapping ceased.

"Can that man raise one side of that casting by driving a little wedge with a hand hammer?" asked John.

"Oh no. The casting was sagging a little at that point. He can raise that one place readily enough," replied Jim.

"But will that heavy bed give at one point and stay

down at another? I should think that it was braced and ribbed enough to stand in any position without distortion. Does it stay where it lies?"

"Until the housings are set it does. The additional weight of the upper works will possibly settle it some, then it will be checked again," said Jim. "See that man with the can of oil? He is probably going to try out the housings on the next machine. Let's watch him."

The can of oil was set on the bed casting near the front face of the housing. Another man laid a bar on top of the housing and lowered a plumb bob partly into the oil. Jim explained that the plumb bob came to rest more quickly in the oil than hanging in the air.

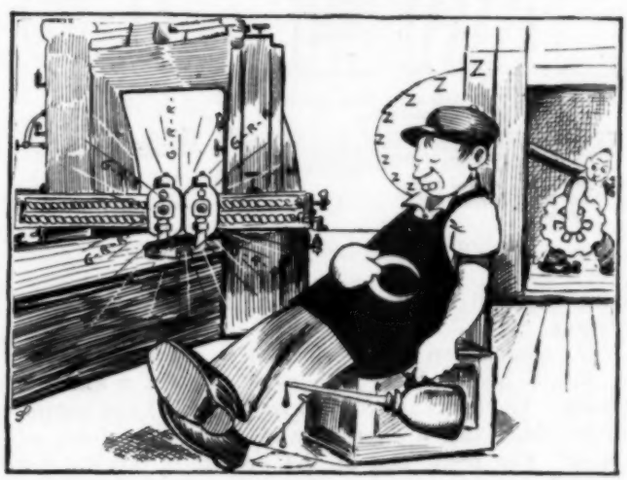
"A good scheme for testing wheel quartering," was Bill's comment.

The housing was checked by placing a micrometer heighth gage against the face and adjusting the spindle to line, top and bottom. After comparing the readings the housing was shimmed with paper and a side check taken. Another face check followed. The workman tried each side of the housing near the ends with a set of feelers.

Kelly explained that the operation was to guide the planer hand in setting the housing for refacing the bottom. Bill and John were somewhat surprised to learn that the housing which stood forward 0.007 in. would go back to the planer for correction. Who could find any fault with that kind of work? Both had done work on chain-feed lathes that were badly "swaybacked" and the only "mike" they had in the old Dick shop at that time was Mike O'Brien the foundry boss.

Jim Kelly made no comment beyond telling them that had the housing stood back at the top three or four thousandths, it could get by. The weight of the cross-rail and heads always brought the top forward and the casting would be favored accordingly.

The method of testing the boring bar brought unstinted praise from both John and Bill. The mechanic placed in the toolpost a piece of wood that had a ball-end pointer in its front face. A large parallel was laid



The planer head collision

across the center of the table front and back. Upon the parallel was set a long try-square. The mechanic ran the pointer to the top of the square and placed a narrow strip of paper some three inches long between the paper and the blade of the square, allowing the paper to project farther at one end than the other. The paper feeder assumed a vertical position but did not fall out. The operation was repeated at the bottom with the same result.

"Some real workmanship," commented Bill.

"Yes sir," said John Dick, "The man who says that tool isn't a first-class job doesn't know what he's talking about.

"You see for yourselves the answer to the cost question," said Jim Kelly. "Our trade demands good tools so we give them what they ask for. We would rather maintain a high standard of workmanship than sacrifice it for the cost. You, Bill, when you made your famous slogan 'More Ton-Miles per Shop-Dollar,' said that 'Stripes and brass ornaments on a locomotive do not move tonnage.' No one heard you complain that we were wrong today in chamfering corners and making the exterior to our machines in harmony with the fitting. The fact is you seemed rather pleased with their presentability."

John and Bill decided that it would be worth the while of their machine shop foremen to learn the same lessons they had learned in their visit to Kelly's plant and Kelly agreed to show them around.

"Close of a busy day," said Jim. "We are going to the house now. The wife will be glad to see you both. We can smoke up and visit after dinner."

Mrs. Kelly subsequently related to Mrs. Dick and Mrs. Weston that the three husbands worked far into the night verbally building mine pumps, locomotives and machine tools. It seems, too, that Kelly related some of his experiences while working as an outside or trouble man. No doubt he had some odd ones.

Calculating Lead Gears—Discussion

By H. H. Welander

I have read and checked the method of calculating lead gears, published on page 629, Vol. 63, of the *American Machinist*. It interested me and, I believe, is good. I have another method to submit as an addition to the subject that will be found as quick in operation and accurate in connection with setups for gear hobbing and other work.

My calculations call into use a booklet published by the Gould & Eberhardt Co., of Newark, N. J., that bears the title, "Decimal Equivalents of Fractions." With this booklet to help we proceed as follows:

Taking a ratio, such as 0.433841, for which it is hard to find an equivalent fraction, we find that

$$13/30 = 0.433333$$
$$36/83 = 0.433734$$
$$23/53 = 0.433962$$

None of the above are accurate enough, as our ratio comes between 0.4339. We therefore subtract the numerators and denominators of the fractions on each side of the unknown one we need and add one-half of this difference to the smaller fraction.

36	83		6.5	15
23	30		23	53
2 13	30		295	680
6.5	15.0			

Thus we find the fraction $\frac{295}{680}$ or $\frac{59}{136}$ the equivalent, according to the booklet, of 0.433823, which is the correct fraction to an error of only 0.000018.

If greater accuracy is required the difference can be divided by 3 or 4 instead of 2 and the result added as before. This plan can be used with any ratio.

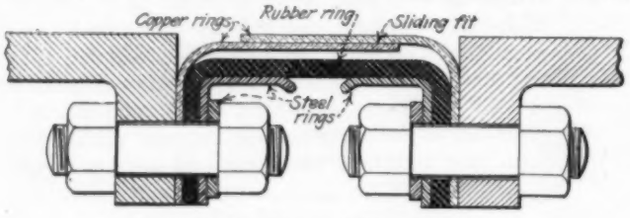
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

A Successful Expansion Joint

BY W. F. SCHAPHORST

The sketch herewith shows how a large Eastern engineering concern solved some of its expansion joint troubles by making such joints leak-tight with rubber. The sketch, I believe, is complete enough so that a lengthy description is unnecessary. The joint is stiff laterally because of the two telescoping copper rings,



Construction of the joint

and at the same time it will withstand high pressure.

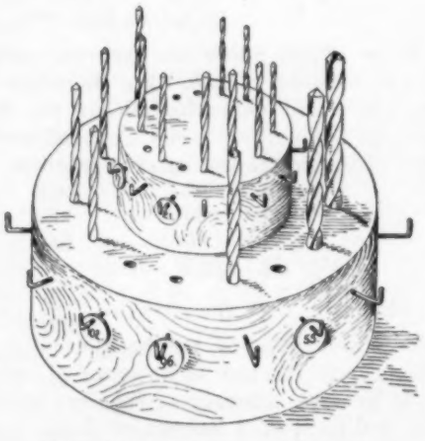
A joint of this kind is excellent for handling water and other fluids that will not attack rubber chemically. It must not be used for high-temperature steam or water, of course, because of the delicacy of rubber at high temperatures.

Handy Drill Block for the Toolcrib

BY H. L. WHEELER

The toolcrib man often has difficulty in keeping track of small number-size drills, and various schemes are employed to assist him but many of them are unsatisfactory. Drill cabinets are an ideal arrangement in large shops where the stock of drills carried is large enough to warrant the expense, but for the shop with but one set of drills, they are too expensive.

In one small shop there is a two-step, round block, made of hard wood. It is drilled with a series of holes to accommodate all of the small drills used, and opposite to each drill there is a small hook on which to hang the workman's check when he takes out a drill. The block is polished and varnished, so that it presents a good appearance.



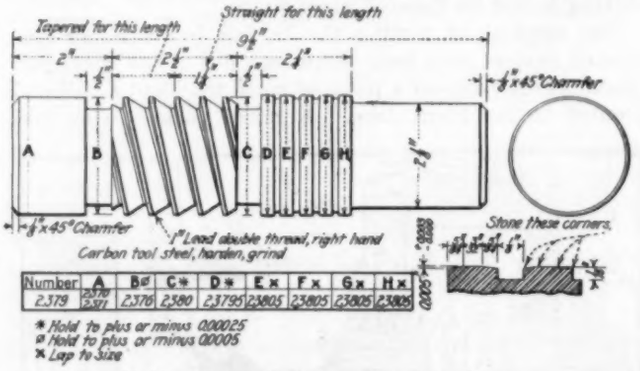
Drill block for small toolcribs

The crib man can tell at a glance where any drill is at any time, since the check is hung on the hook before the drill is issued. There is little chance for the drill or the check to become mislaid.

Spiral Broach for Bearings

BY FRANK C. HUDSON

The use of broaches for round holes seems to be increasing. In most cases, however, the broach is made with circular grooves that present a square cutting edge to the work. The engineers of the Chandler Motor Car Co., have devised a broach for round holes that gives a shearing cut and that seems to have some advantage over the older design. At any rate it is



Helical broach for engine bearings

giving excellent results in finishing the bores of motor bearings.

The construction of this broach is shown herewith, the details being given, both as to dimension and tolerances. The teeth are formed by a double helix having a 1-in. lead, and are practically a buttress form of thread. The front end of the broach is tapered for half its length, the amount of taper being the difference between diameters *B* and *C*. The remainder is straight.

A study of the diameters of the burnishing rings shows that the first ring *D* is 0.0005 in. smaller than *C* but that *E* is 0.0005 in. larger and that this size is maintained on the other rings. The details of these burnishing rings are given in the sectional view at the right, enlarged four times. This detail gives the amount of taper on each end of each ring and indicates the care taken to secure a perfect bearing.

IDEAS FROM PRACTICAL MEN

Tool for Cutting Recesses in Small Deep Holes

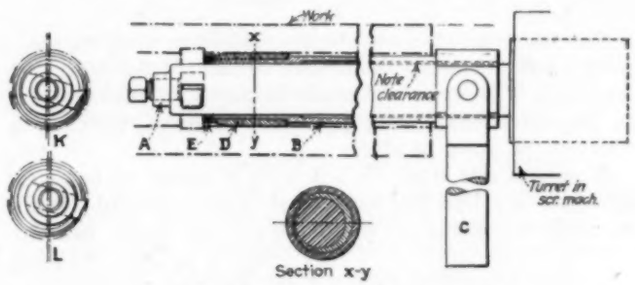
By Sigurd Brantingson

In the sketch shown herewith, is a tool for cutting a recess $\frac{3}{4}$ in. wide, $9\frac{7}{16}$ in. from the end of a hole. Since the diameter of the hole is less than $1\frac{1}{8}$ in., it can be seen that considerable trouble in chattering, as well as holding the depth of cut, would be experienced in using a boring bar of ordinary design.

The tool consists of the steel bar *A*, one end of which fits the turret of a screw machine, while the other end carries a high-speed toolbit; and a bronze bushing *B*, eccentric on one end, as shown in section *X-Y*, concentric on the other end and made to revolve on the bar *A* when lever *C* is moved up or down. The bushing *D* is made of steel, hardened and ground to a diameter slightly smaller than the hole to be recessed. It is held in place by the nut *E*, and made to revolve with the work on the bronze bushing.

The operation of the tool is simple, the cutter is placed in the work as shown at *K*, with the lever *C* in a downward position, the face of the cutter being below the surface of the bushing *D*.

As the work revolves, the lever is brought upward, and owing to the eccentricity of the bushing, forces



A recessing tool for deep holes

the cutter forward, as at *L*. But as the tool is cutting, the bushing *B* revolves with the work and acts as a bearing on the end of the bar.

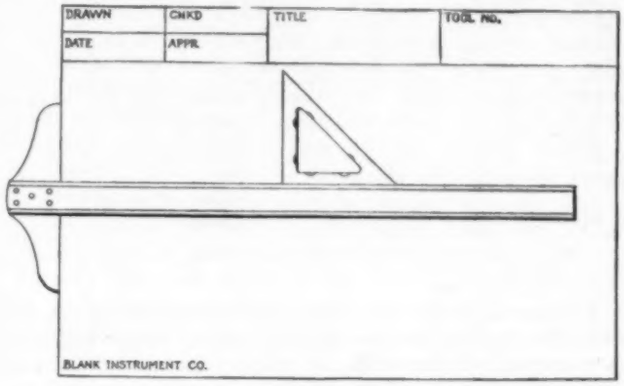
The advantage of a support or bearing at the end of the bar where the strain is greatest is obvious, since it eliminates the chatter caused by the spring of an unsupported bar of this length. Another advantage is, that after the cutting tool is once set, the depth of cut will be the same in all pieces. Various sizes of holes may be recessed by using bushings to fit the work, and the depth of the cut may be regulated by adjusting the toolbit in the bar.

Simplified Drafting-Room Practice

By B. J. Stern

Some time ago I worked in the drafting room of a Long Island Shop that used the system here described for detailing its tool and special machine drawings, and which I think good enough to pass on to your readers.

The shop made instruments of a very high degree of accuracy but in no great quantities. Its jigs, fixtures, etc., were therefore of the simplest type, mostly built-up. Its drafting system was as equally simple. After a design was laid out it was turned over to a detailer. He was supplied with a pad of a hundred



How the pads were used

sheets bound together and backed by very heavy cardboard. Each sheet was printed somewhat as the sketch herewith. Instead of pinning his detail sheets to a board, the detailer worked directly on the pad with a small T-square against its edge. Between the two upper sheets he slipped a carbon paper such as used by typists, and thus the detail drawn on the top sheet was reproduced on the one beneath. The carbon copy was sent to the shop as a working drawing, while the original was kept as a record.

In this way most of the blueprinting was avoided, and the drawing for a fixture could be gotten into the shop with the minimum loss of time and energy. All details except very large items were drawn in this way, and while the result was never elaborate, it was plenty good enough for tool and special machine drawings.

Determining Drilling Speeds and Feeds for Steel Castings

By Roscoe Ammon

Latrobe Tool Co., Latrobe, Pa.

The speed and feed charts in the back of twist-drill catalogs vary to such an extent that few practical shop men pay much attention to them. Similarly, the various spectacular, but unpractical, stunt performances by twist-drill and drill-press manufacturers under ideal conditions have caused the average shop foreman to say "It's all bunk."

A manufacturer who drills thousands of $1\frac{1}{8}$-in. holes in steel castings monthly recently installed a heavy-duty 6-ft. radial drilling machine, and before setting rates on the machine made tests to determine the speed and feed that would give the greatest average hourly production at the lowest tool expense.

From previous experience, it was known that approximately 65 ft. was the best cutting speed on their work. Starting at 227 r.p.m., which was the nearest speed available, a variety of feeds were tried with the following results: Electro-furnace steel castings, $2\frac{1}{4}$ in. deep, $1\frac{1}{8}$-in. drill, 227 r.p.m. (67 ft.), plenty of compound from a $\frac{3}{4}$ in. pipe, column of machine locked before start-

IDEAS FROM PRACTICAL MEN

ing feed, 9 grinds with each feed and all drill grinding done by hand.

Feed per Rev., In.	Rate of Penetration per Min., In.	Approximate Cutting Time 2¼ in. Deep Min.	Sec.	Average Holes per Grind	Condition of Drill
0.007	1.58	1	30	41	Corners dull. Cut off 3/16 in.
0.012	2.72	..	50	68	Corners dull. Grind off 1/8 in.
0.016	3.63	..	40	89	Dull. Grind off about 1/8 in.
0.022	4.99	..	29	86	Dull. Grind off about 1/8 in.
0.029	6.58	..	23	56	Edges chipped a little Grind off 1/16 in.
0.04*	9.08	..	17	23	Chipped

* Only three grinds at 0.040 in. as feed was too heavy, causing drills to chip.

The margins of the drills wore more rapidly at the finer feeds than at the heavier feeds, indicating that penetration of the scale is responsible for the wear, since the corners of the drill must pass through the scale more often. The condition of the drills was about the same on both the 0.016 and 0.022 in. feeds, with only a few more holes per grind in favor of the lighter feed, which was easily offset by a gain of 25 per cent in cutting time when using 0.022 in. feed. Therefore, the 0.022 in. feed per rev. was adopted as the most economical feed. Using this feed as standard, different speeds were tried with the following results:

R.p.m.	Speed In. Ft. per Min.	Rate of Penetration per Min., In.	Holes per Grind	Condition of Drill	Amount of Grind Required for Resharpening
176	52	3.87	97	Dull	1/16 in.
206	60	4.53	93	Dull	1/16 in.
227	67	4.99	86	Dull	Plus 1/8 in.
254	75	5.58	61	Corners slightly gone	Plus 3/32 in.
276*	80	6.07	26	Corners burned	1/4 in.
302*	85	7.08	14	Corners burned	1/2 in.

Nine grinds at each speed, except those marked *, where only three grinds were run due to the high speed.

Wear at the corners of the drills was first noticed at 227 r.p.m. where the loss on the three grinds was about 1/16 in. as against less than 1/4 in. at 206 r.p.m. proving that a 60-ft. peripheral speed with a heavy feed is the best for cast steel. At the higher speeds, the corners of the drill would burn after one or two holes, whereas at slower speeds the drill got dull gradually, and usually after drilling the same number of holes. Production varied little between 206 r.p.m. (60 ft.) and 227 r.p.m. (67 ft.) but figuring in the toolroom cost of regrinding and double the number of drills required at 227 r.p.m., the lower speed proved cheaper and was adopted.

On similar work, using two machines in fairly good condition, the best feed that could be made when the spindle was half way out on the arm is 0.013 in. per rev. Lost motion in the spindle accounted for some of the trouble, but "lift" in the arm was the chief fault. The machines had a hand column-clamp, and, as usual, the operator ran with just enough tension on the clamp to keep the machine from vibrating while drilling. After a few months, the machines were so loosened that heavier feeds were useless especially on hard material. A feed of 0.018 in. could not be used except when the spindle was positioned close to the column. If the machines had been provided with a column clamping-device located conveniently to the operator, so he could clamp the column without having to walk around the machine twice for every hole drilled, the machines would, to-day, be in good shape and able to produce cheaper holes.

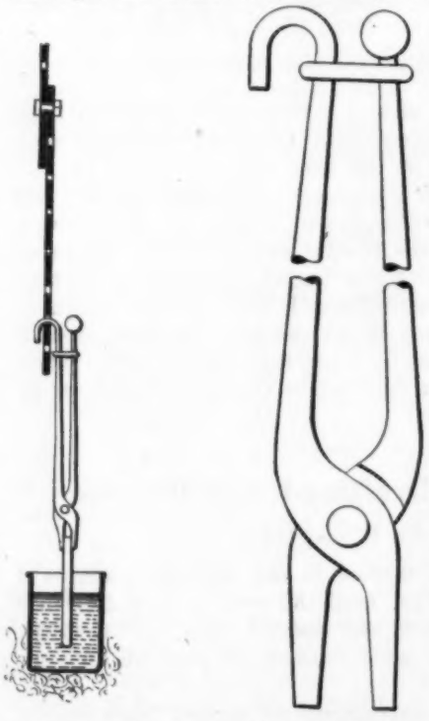
To show what the "drop" in the spindle of a drill press does to drills, an average of only 42 holes per grind at 224 r.p.m. (66 ft.) and 0.013 in. feed (2.91 in. rate of penetration) was permissible on the old machines as against 68 on the new machine at approximately the same speeds and feeds. The drills used on the older machine had their margins worn so that approximately 1/16 in. had to be removed at each grind. This difficulty was caused by the weight of arm or spindle "punching through" when the point of the drill reached the bottom of the hole, throwing the load of an extra-heavy chip, several times the thickness of the feed, on the corners of the drill. Figuring holes per grind and "grind away" per grind, the new machine should use less than one-half the number of drills that the older machines do; to say nothing of an increased output of about 60 per cent.

Tongs for Use in Selective Hardening

BY H. L. WHEELER

The illustration shows tongs that have been successfully used for suspending pieces in a lead bath for heating. The tongs are made in pairs, so that as soon as one piece has been heated and removed, another is ready to be hung in place.

A bar of flat iron, drilled with a series of holes, is attached to a like bar suspended from overhead. Bolts through the holes serve to adjust the lower bar for height. The hook on the tongs is placed in one of the holes in the lower bar, thus allowing the piece to enter the lead a predetermined distance. With this arrangement, duplicate pieces can be heated at the same locality, and on production work the speed is limited only by the time of heating. The tongs have a hook on one leg and a ball on the other, the combination acting to keep the locking link from coming off.



Tongs for use in the lead bath

Characteristics of Mond "Seventy" Alloy

MOND "Seventy," a nickel-copper alloy containing a small percentage of manganese, possesses physical and mechanical characteristics that render it of value as a metal for the manufacture of a variety of mechanical parts. The approximate composition is:

Nickel	70	per cent
Copper	26	per cent
Manganese	4	per cent
Impurities are less than	1½	per cent

Commercially pure materials are used in making the alloy, to insure uniform composition and structure.

Mechanical Properties

Mond "Seventy" combines a high tensile strength with malleability, ductility, toughness and resistance to shock. Values for these properties of hot-rolled rods, as received from the mill, are as follows:

Yield point, lb. per sq.in.	39,770	
Maximum stress, lb. per sq.in.	91,170	
Elongation	47.8	per cent
Reduction of area	66.9	per cent

Brinell hardness determination on the longitudinal and transverse sections is 149. The specific gravity is 8.72 and the coefficient of expansion is 0.0000161. Tests made at temperatures up to 750 deg. F. show that there is no diminution of tensile strength and only a slight lowering of the yield point, making the alloy useful for the construction of parts that are liable to be under tension or compression.

Corrosion Resisting Properties

Mond "Seventy" possesses corrosion-resisting properties characteristic of nickel-copper alloys. It is resistant to atmospheric and sea-water corrosion and to the action of the common acids and alkalis. It is especially resistant to the action of ammonia, either in its aqueous solution or as a gas, to caustic alkali or carbonate solutions and to pure alcohol or alcohol-containing substances.

The resistance of the alloy to steam erosion and its strength at high temperatures, that are slightly higher than those of steels and bronzes, have made possible its application for the making of steam-pressure valves and steam-turbine blading. For such uses it is well suited by reason of its thermal expansivity being equal to that of steel. The alloy is also used in the construction of mining machinery, dyeing machinery and equipment, and in chemical and oil industries for miscellaneous parts exposed to corrosive conditions.

Electrical Properties

Mond "Seventy" can be used as an electrical resistance material, being supplied in rods, wires and tapes. It is suitable for resistance work where exposure to weather conditions or considerable temperatures might be reached under working conditions. No mechanical breakdowns will take place up to 500 deg. C. The specific resistance is 50 michroms per c.c. and 301 ohms per sq.mil. foot.

Forging, Annealing and Welding

Mond "Seventy" should be forged or hot rolled at a temperature of 1,800 to 1,900 deg. F., after which it can be cold rolled into sheets or drawn to rods or wire. Annealing should be accomplished in tight pots to prevent oxidation and scaling. A suitable annealing temperature for general work is 1,500 deg. F.

Mond "Seventy" may be welded by the oxyacetylene, metallic or carbon-arc, or by the resistance welding methods. In using the oxyacetylene process the flame should be slightly reduced and the torch tip should be one to two sizes larger than the tip used for steel of the same size. No flux is usually necessary, but the work should be clean and free from scale. Care should be taken to use bright, clean welding rod and to avoid oxidizing the weld. The weld should be built up well above the surface and completed in one spot before starting another. The metallic-arc welding resembles the practice used for steel. The resistance welding by the spot or butt method is similar to that adapted to steel. The metal may be welded to copper or steel by this process. Soldering and brazing of Mond "Seventy" is accomplished in the same manner as for copper. It is best, in soldering, to tin the surfaces before making the joint.

Machining and Polishing

The machining of Mond "Seventy" requires, for turning, a speed of approximately 60 ft. per min., using a high-speed steel tool. For drilling, the average speeds recommended by twist-drill manufacturers can be used, grinding the drill points to standard angles and clearances. Reaming should be performed at a slow speed, approximately 15 ft. per min. Milling speeds are similar to the speeds used for turning, using high-speed cutters. Mond "Seventy" takes and maintains a high polish. The methods and materials used in polishing nickel can be used in polishing this alloy.

The practice in working the alloy by drawing and stamping is similar to the principles followed for steel. For drawing, a slightly slower stroke has been found advantageous. In deep drawing, the point at which the annealing can best be accomplished should be determined experimentally.

Variety of Forms

Mond "Seventy" is made in the following forms:

Cast ingots—round, square or slabs.

Cast anodes—for electroplaters, cast in various forms from patterns.

Hot rolled—round or square billets for rerolling, sheet bars for rerolling, plates, rods in flat, round, square, hexagon and octagon and wire rods.

Cold rolled—sheets and strips, bars and rods, wire, seamless tubing, standard seamless pipe, welded tubing, washers, forgings, pipe fittings and valves.

The alloy is a product of the American Nickel Corporation, Clearfield, Pennsylvania.

For the data given we are indebted to the manufacturer.

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Punch here to suit your binder

Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Two Points on Air Compression

Q. Please advise us on what to base a determination for the proper size of a receiver in an air compressor installation. Please also explain the uses and advantages to be gained by installing an after-cooler.

A. In general an air receiver should be sufficiently large to maintain a steady pressure in the line when the demand is variable. It should also be large enough to retain the air a sufficient time for it to cool and deposit part of its moisture before entering the delivery line.

A rule to arrive at the minimum necessary size is to compute the volume that would be occupied by the air when it is compressed to the working pressure at the rated capacity of the machine for one minute of operation.

For example, assume a pressure of 90 lb. gage and a compressor rated at 880 cu.ft. of free air per minute. The volume capacity of the receiver should be roughly

$$\frac{15 \times 880}{90 + 15} = 125 \text{ cubic feet.}$$

An after-cooler is used to reduce the temperature of compressed air, as it comes hot from the compressor, to approximately normal. By so doing, the moisture is condensed and can be removed before it enters the delivery lines. This is a feature to be desired since once this moisture is carried over with the air into the lines it causes trouble at the tools.

Air Hammer Lubrication

Q. We operate a number of air hammers on our assembly work and lubricate them with the same oil that we use on our other mechanical equipment. In fact, we keep them suspended in a tank of oil at all times when they are not in use and overnight when the department is shut down. Yet we do not believe we are getting correct results, as shown when the hammers are taken down for inspection and repair. Please advise us if you know of a better method than the one described.

A. In an air hammer, it is difficult to keep a film of lubricant at all times due to the wiping action of the air and due to the moisture which is usually entrained in compressed air. The water has a particularly bad tendency to prevent the oil from reaching and adhering to the rubbing surfaces.

Your method of suspending them in oil is good to prevent rust and for lubrication providing they are immersed far enough to admit oil to the valve through the air inlet. Unless this is done and unless an additional amount of oil is put in at intervals during the day the valve parts are likely to be operating without any lubrication most of the time.

A better plan, we believe, is to use a special grease that is made for this particular purpose by a number of reputable companies. The air hammer manufacturers market it also. This grease has the property of adhering to and covering the working surfaces in a manner to resist removal by action of the air and moisture. It is light of body at the same time so it does not make action sluggish.

It is also a good plan to have one man responsible for the application which should be made at the start of a shift, at the noon period and at the close of work. A small amount of the grease is injected through the air inlet each time and is distributed as soon as the air is turned on. If there is a great deal of moisture in the line the greasing should be done more frequently.

This grease is also very good for use in other pneumatic tools in the place of oil but should be used only after consulting the tool manufacturer.

Responsibility for the Stores Department

Q. Please give your opinion as to whether supervision of the stores department should be the function of the production manager or the purchasing agent? We are considering a reorganization of our stores department since we are having a great deal of trouble from running out on various items without proper steps having been taken to replenish the supply. We ask your advice without telling you our past practice in order to receive an answer, from a disinterested standpoint, that we can use to help settle our own differences of opinion.

A. In our opinion the stores supervisor should be answerable to the man whose direct duty it is to place purchase orders for delivery in time to meet the withdrawals from stores. But we also believe that this man should also be responsible for the extent of the inventories. Only in the purchasing agent can both functions be combined.

The purchasing agent's direct interests are costs of materials, delivery to meet demand, and a maintenance of low inventories consistent with production schedules. He knows the markets and the time needed for delivery.

The production manager is directly interested in delivering finished production to the shipping platform and has only indirect knowledge in markets for materials, intervals required for delivery and inventories of a thousand and one incidental supplies.

Incidentally we guess that your present stores organization is under production control and that the difficulties are largely due to the failure of the stores supervisor to notify the purchasing agent in time to stop a shortage, coupled with the latter's failure to secure rush delivery. Making the agent responsible for shortages solves the trouble at once.

Technical Abstracts

Diesel Locomotives in Russia

Professor G. Lomonossoff who has been a protagonist of Diesel locomotives for a long time gives an important discussion of the extended trials of a Diesel electric locomotive in Russia. The total distance traveled amounts now to over 10,000 miles, comprising every kind of grade, climate and weather.

Direct comparisons show that the Diesel locomotive consumes only 22.5 per cent as much fuel as a steam locomotive of the same power, and that its water requirements amount to only 3 or 4 gallons per 100 miles. This is very important in many parts of Russia. Of great importance also is the avoidance of standby losses. The Diesel engine is stopped if the stop lasts more than 5 minutes, while steam must be kept up continuously in a steam locomotive.

It is proposed to provide a special auxiliary drive on future Diesel locomotives so that the engine can be stopped also on down grades. On long up grades it has been found possible to run the Diesel locomotive faster than the steam locomotive. On short very heavy grades the steam locomotive may run faster since it is then permissible to draw temporarily on the water level. The electric motors must not be overheated. In the hot desert regions of the Caucasus this sets a limit to the speed on the train weight possible on long grades. A gear Diesel does not have this limitation. It has, however, been found that the steam locomotive also must operate at reduced train loads on these grades.

The Diesel-electric locomotive has been found to need much less inspection than the steam locomotive and it has been found capable of traveling some 40,000 to 55,000 miles per year, which is said to be two to three times more than the steam locomotive. This makes up for the difference in investment which is about twice as high for the Diesel machine. The maintenance gang for the Diesel-electric engine must consist of three men, while two men are enough for a steam machine (for a geared Diesel or one with hydraulic transmission the electrician is not necessary and the crew is the same in both cases). The consumption of lubricating oil is somewhat higher for the Diesel but is not a serious economical item.—*Zeitschrift des Vereines deutscher Ingenieure*, Oct., 1925, 31, p. 1387.

Group Premium

L. J. Houlihan, industrial engineer, Ritter Dental Manufacturing Co., discusses group premium for an automatic screw machine department. At first glance, such a department would seem to lend itself most readily to a straight piece-work plan or, in some cases, to an individual premium plan. After a careful analysis of all conditions it will be seen, however, that the group premium system has advantages possessed by none of the others previously mentioned, while the disadvantages of the former are eliminated. This system can be made to function whether the plant has continuous production or manufactures for stock, whether the operators both set up and operate or whether set up men and job tenders are employed.

Much available production which could easily be taken advantage of is lost and unnoticed under an individual plan. If an operator has a group, say, of four machines, and has them running, he promptly finds a comfortable spot and spends his time watching them work. His reasoning, and he is justified in it, is that when setting up he is costing the company money, but that with all his machines going, he is producing to his limit and no objection should be registered if he sits down and does nothing. Then, too, he is satisfied for he is making enough premium and has not the least interest in the rest of the department. He could spend part of his time aiding someone else, but there being no incentive, he does not do it.

The first step in every wage incentive plan installation is the determination by scientific job analysis and time study of the time required to perform a given operation. With an automatic machine, this appears to be very simple but a clever automatic operator can, if the observer is not equally clever and alert, easily deceive the observer as to the machine's capacity on a given operation. Mr. Houlihan's experience is that under a group premium system the operators' earnings surpassed consistently their peak point under the individual premium plan. In the final analysis the group premium system achieves results unobtainable under any other plan. It has discovered productivity in operators that no other system could find.—*Management in Manufacture*, Nov., 1925, p. 281.

Apprentice Course of Siemens and Halske

The well known German electrotechnical concern, Siemens and Halske, has developed in its Vienna factories a noteworthy system of apprenticeship training for mechanicians and tool makers. The applicants must pass through a common school with good grades, be physically fit and in addition satisfactorily pass a psychotechnical test given by the firm itself.

The apprentices are for the most part trained in a special shop and under special foremen. But for a time they are made to work in the regular production shops so as to become familiar with the atmosphere and the system. All objects are produced by the apprentice from drawings which they have to make themselves. Premiums are given from time to time for excellent work.

A very German idea is to make excursions with the apprentices during the summer season. Song and gymnastics form part of the entertainment. The weight and height of all apprentices are ascertained every six months, and in case of unsatisfactory conditions, corrective measures are taken. The problems of the apprentices involve difficult samples from the firm's own line.—*Betriebstechnik*, Nov., 1925, p. 453.

American Machinist

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KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Distribution Problems to the Fore

PRODUCTION, as a national problem, appears about to be eclipsed by distribution. At any rate the recent Distribution Conference staged in Washington by the Chamber of Commerce of the United States has done much to focus attention on it. That production is not entirely out of the picture, however, may be inferred from a statement made at the conference that one of the greatest benefits possible from improved distribution methods would be the reduction in cost of production resulting from smoothing out the fluctuations in sales curves.

Six voluminous subcommittee reports were presented and acted upon at the conference. In them there is plenty of material for careful study. Perhaps it is not too much to hope that the conference is the first step in a program that will result eventually in putting our distribution system on a sound economic basis.

Patent System Again in Danger

OUR patent system is again facing a crisis. Functioning of the patent office itself has been greatly improved by increased salaries for examiners, but now the federal judges, under whom exclusively the adjudication and enforcement of patents are performed, are resigning because of inadequate salaries. Men well versed in patent law are leaving the bench and are being replaced by men who will have to become proficient as they decide cases. These federal judges do not have opportunity to add to their incomes by outside work.

United States district judges receive $7,500 per year, circuit judges $8,500. Judges of the supreme court in the state of New York receive $17,500; in New Jersey $18,000; Pennsylvania $17,500; Illinois $15,000; Massachusetts $12,000; Michigan $10,000. The federal judges have social and professional obligations at least equal to the obligations of state judges, but their salaries do not permit the filling of their obligations, especially in the larger cities.

There are 191 federal judges in the United States and their present combined yearly salaries amount to $1,535,991.91, about one and one-half cents per capita. Bills providing for an increase of about one-half cent per capita have been introduced into congress. They provide for raising the salaries of the chief justice of the United States to $20,500; associate justices of the supreme court to $20,000; circuit judges in the second circuit, comprising New York and Vermont to $15,000; circuit judges in the four next most populous circuits to $14,000; and circuit judges in the remaining of the nine circuits to $13,000.

The bills provide for the district judges $10,000, with the provision that if the population in a district exceeds 2,000,000 the salaries shall be increased $500 for each 100,000 population in excess of that sum up to within $1,000 of the circuit judges' salary. If the differential in favor of the salaries in the more populous districts should not be enacted, then the salaries for the district judges in general should be correspondingly raised.

These proposed increases are in no way extravagant. Certainly it is well for industry to have the federal judges, who handle its patent cases, free from the personal financial worries bound to exist when salaries are inadequate; free to give the careful thought and concentration demanded by their judicial duties.

The bills providing for increases in the salaries for federal judges were introduced by representative George S. Graham, of Pennsylvania, chairman of the judiciary committee of the House of Representatives, and Senator David A. Reed of Pennsylvania. They have the endorsement of American Engineering Council and the American Bar Association, and the influence of these organizations is considerable. To it should be added the influence of individual engineers and business men. The way to add that influence is to write to your congressmen, asking them to vote for the bills. And the time to do it is, of course, now.

A Step in Standardizing Railway Repairs

SOME said it couldn't be done, that standardization of repairs to locomotives was not feasible. But the article on page 1003 shows how one road at least has adopted definite oversize diameters to which all valve chambers are rebored. Instead of setting the tools on the job, the boring heads are set to standard diameters in the toolroom and the bushings can also be turned to standard oversizes, as is done with automobile pistons and rings.

The article also shows the use of modern devices for driving boring bars through a standard gear reduction unit and a method of boring both ends of the chamber at once.

There are doubtless numerous other opportunities to adopt standard over- or under-sizes to advantage in cylinders, crankpins and similar parts. The practice of just "cleaning up" the part regardless of diameter, means that more fitting has to be done than seems necessary. Standard sizes reduce the cost of repairs.

Shop Equipment News

Rivett Motor-Driven Internal Grinder No. 104

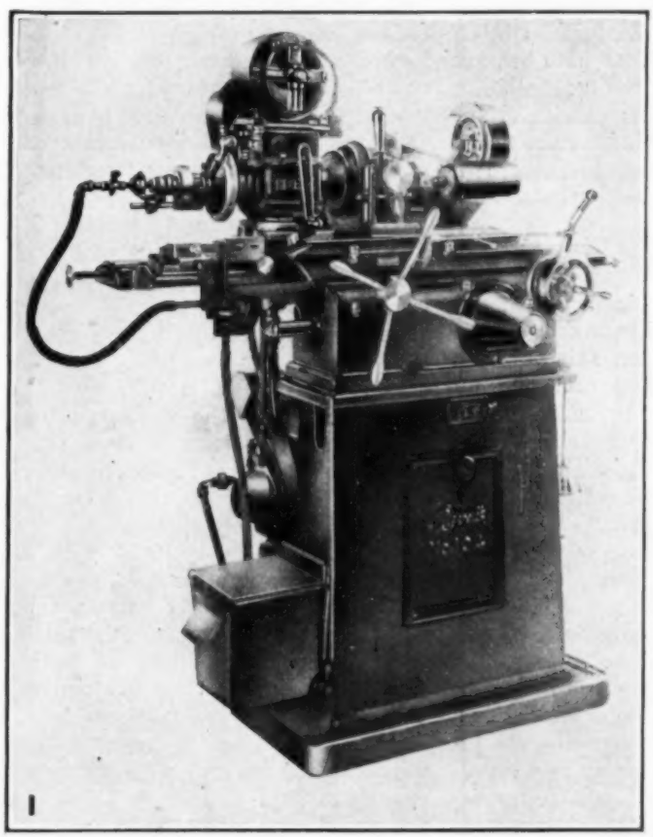
The Rivett Lathe & Grinder Corporation, Brighton Dist., Boston, Mass., has brought out an addition to its well-known type of internal grinding machines to grind small and accurate holes on a production basis. Its range is from $\frac{1}{4}$ in. to 2 in. in diam. of holes, and the table has a stroke that can be adjusted from $\frac{1}{4}$ in. to 2 in. in the distance of its reciprocation.

The reciprocating mechanism is the same in principle as has been used in all the earlier Rivett machines; the actuating member being a tapered heart-shaped cam so designed as to accelerate and decelerate the movement of the table as it approaches or recedes from the point of reversal at each end of the stroke. A comparatively slow rate of traverse is thus automatically imparted to the grinding wheel as it passes the mid-position in either direction.

The machine is driven by two independent motors. The table and feed movements are derived from jackshafts that run in ball bearings carried in brackets that are bolted to the rear of the cabinet-base. The power is supplied from a 3-hp. electric motor, mounted on a platform that extends from the base at floor level, and it is transmitted through the medium of silent chains. Belts from these shafts drive the table movements, a lubricant pump and the grinding-wheel spindle. A pair of 3-step cones in the table drive provide means of regulating the traverse speed to suit the amplitude of the stroke.

The bed of the machine is a single box-section casting of gray iron, heavily ribbed to secure the required strength and rigidity. Integral with its upper surface are the "V" and the flat ways upon which the table slides and also the guideways to carry the cross-slide. The design of the table is such that the ways are never uncovered, thus protecting the bearing surfaces against injury from dirt or particles of abrasive.

The reciprocating table is in two parts. The upper part, carrying the workhead, can be swiveled to 5 deg. either side of the centerline for the purpose of grinding tapered holes that do not exceed 10-deg. included angle. To grind tapered holes of wider angularity the workhead can



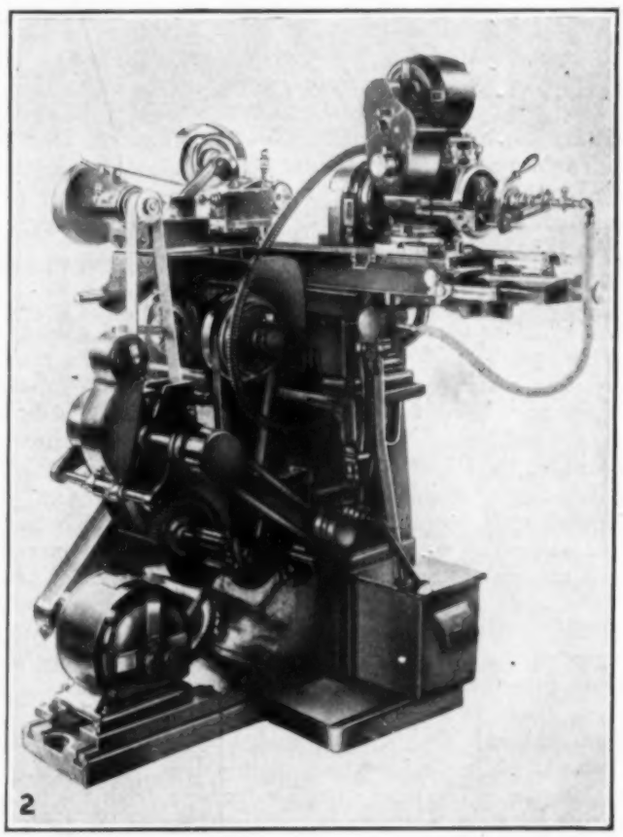


Fig. 1—The Rivett No. 104 motor-driven internal grinding machine. Fig. 2—A rear view of the machine, showing jackshafts and drive

SHOP EQUIPMENT NEWS

be swivelled upon its base to an angle of 45 deg. in either direction. The base of the workhead is graduated to facilitate setting and is an indication of the care used in the design of the machine to make it adaptable to accurate set-up.

The table is independent of the reciprocating slide and is clamped to it by a convenient binder, so that by releasing this binder the table is under manual control from a four-spoked capstan wheel and can be moved by hand to any position within its range without interference from the cam-operated slide. An adjustable stop screw enables the operator to re-engage the table and slide at a predetermined position, so that after having withdrawn the wheel from the work for any purpose it can be returned repeatedly to its previous position with respect to the points of reversal.

The Workhead Unit

The spindle of the workhead is of tool steel, hardened and ground. The main journal is of the two-taper type, having angles of taper of 3 and 45 deg. respectively. The bearing is also of tool steel, hardened, ground and lapped. At the rear end of the spindle the bearing is a split sleeve of tool steel, also hardened, ground and lapped, having a parallel bearing surface and a tapered outer surface with ring adjusting nuts to make compensation for wear.

An independent motor mounted on the workhead drives the spindle through a silent chain and helical gearing. The normal rotating speed of the spindle is 600 r.p.m., but alternative gearing can be supplied to secure any speed from 600 to 335 r.p.m., inclusive. The spindle is controlled by a clutch and brake so that it can be stopped and restarted without reference to the motor. This control is so connected to the table movement that the withdrawal of the table automatically stops the spindle, releasing the brake and re-engaging the clutch as the grinding wheel is returned to working position. There is a clear hole $\frac{3}{4}$ in. in diam. through the spindle, and a $1\frac{3}{8}$-in., 12-pitch U.S.F. thread on the spindle nose. The head swings work 8 in. in diameter over the bed of the grinder.

The grinding-wheel spindle runs upon four annular ball bearings, so mounted as to compensate automatically for whatever expansion may take place because of temperature changes. The spindle and its bearings constitute a complete unit that is easily removable from its supporting bracket without disturbing its adjustments. Two units are available, one designed to run 23,000 and the other 36,000 r.p.m. Shaft extensions are provided in a variety of sizes, either integral with the spindle or with removable wheel arbors to meet the requirements of the work in question.

A constant-feed oil cup, which is mounted on the spindle unit, supplies lubrication to the bearings, and a specially designed impeller is made a part of the spindle itself to distribute the oil uniformly to all the bearing surfaces. The unit is held in a bracket that is part of the cross-slide, and the latter is gibbed to the slide-ways and provided with a taper wedge by which to maintain proper adjustment.

The spindle is driven by belt from a small countershaft at the rear of the cross-slide, which countershaft is in turn driven by belt from one of the jackshafts on the base. The countershaft bracket is adjustable along the cross-slide to maintain proper belt tension. The belt to the wheelspindle runs under a ball-bearing idler to secure a proper amount of belt-wrap around the small pulley.

Movement of Cross-Slide

The cross-slide is actuated by means of a large handwheel on the front of the machine, fitted with a micrometer-graduated dial and an adjustable pointer to indicate the relative position of the slide. The large diameter of the dial and comparatively fine pitch of the cross-screw enable the operator to make settings in increments of 0.0005 in. in advance of the cross-slide.

An important feature of the machine is the visible gaging device by which the operator is apprized of the approach to finish size of hole. A diamond-tipped finger bears upon the ground surface immediately behind the wheel, entering and receding from the hole at each reciprocation of the table. This intermittent contact of the diamond allows a larger size of wheel and spindle to be used than would be the case if the measuring device remained in the hole.

Through a system of multiplying levers the position of the diamond is indicated by a pointer that moves over a fixed dial, and, by previously setting the dial in accordance with the size of hole desired, the completion of the work is indicated by the approach of the pointer to zero.

The wheel-truing device is supplied in two forms: a tip-over bracket that is clamped to the machine table and the diamond brought into position to dress the wheel as occasion requires; and a micrometer-adjusted diamond tool that is located close to the work and is of assistance to the operator in determining accurate sizes.

Finishing the Work

This diamond does not, however, exercise automatic control over the size. In practice the work is ground to within 0.001 in. of finished size, when the wheel is withdrawn from the hole and passed over the diamond to true and sharpen it. While the wheel is in contact with the diamond the dial of the cross-slide is set at zero. The slide is then backed away slightly, the wheel re-entered into the work, the table traverse and cross-feed re-engaged and the grinding allowed to proceed until the pointer again registers zero on the dial.

The diamond occupies a position in a plane exactly to coincide with the line of contact between wheel and work, so that a hole is made larger or smaller (indirectly) by adjusting the micrometer control of the diamond. When it is thus used in conjunction with the visible gaging attachment, the claim is made that the necessity for plug gages or other means of measuring the work in progress is entirely eliminated.

The machine is equipped with a tank for cooling medium, with pump, piping and distributing nozzles, and with an automatically operated valve which cuts off the supply of liquid when the reciprocating mechanism is disengaged and the table run back to adjust or change the work. The weight of the machine with standard equipment and motors is 1,600 lb. net, and it requires 42x66 in. of floor space. The height is $45\frac{1}{2}$ in., measured from the floor to the center of the workspindle.

SHOP EQUIPMENT NEWS

Norton Roll-Grinding Machine, 54-Inch

The Norton Co., Worcester, Mass., has built the roll-grinding machine illustrated in Fig. 1. It is powered by four motors with a combined rating of 70½ hp. and with a capacity over the bed to swing rolls 54 in. in diameter and 21 ft. long.

The wheel carriage, which is the traversing member, is a self-contained unit and mounts the motors for traversing the table, driving the panel on which the motor switches and controls are mounted. The starting and the stopping of all four motors are effected by means of push-button switches.

The wheelslide is provided with sufficiently large ways to give the rigidity required. The spindle is made of alloy steel, forged and heat-treated. Bearing surface is provided in adjustable hard-bronze work bed and weighs approximately 10,850 lb. The weight of the spindle is 1,900 lb., and it is 12 in. in diameter. The total bearing length of the two spindle boxes is 51⅛ in. A 20-hp., adjustable-speed motor is used to drive the spindle gear through a spur-gear reduction train. The spindle gear runs in a bath of oil. End thrust of the spindle is taken by a heavy roller bearing. A tool steel center 6 in. in diameter is used for setting up the work and for

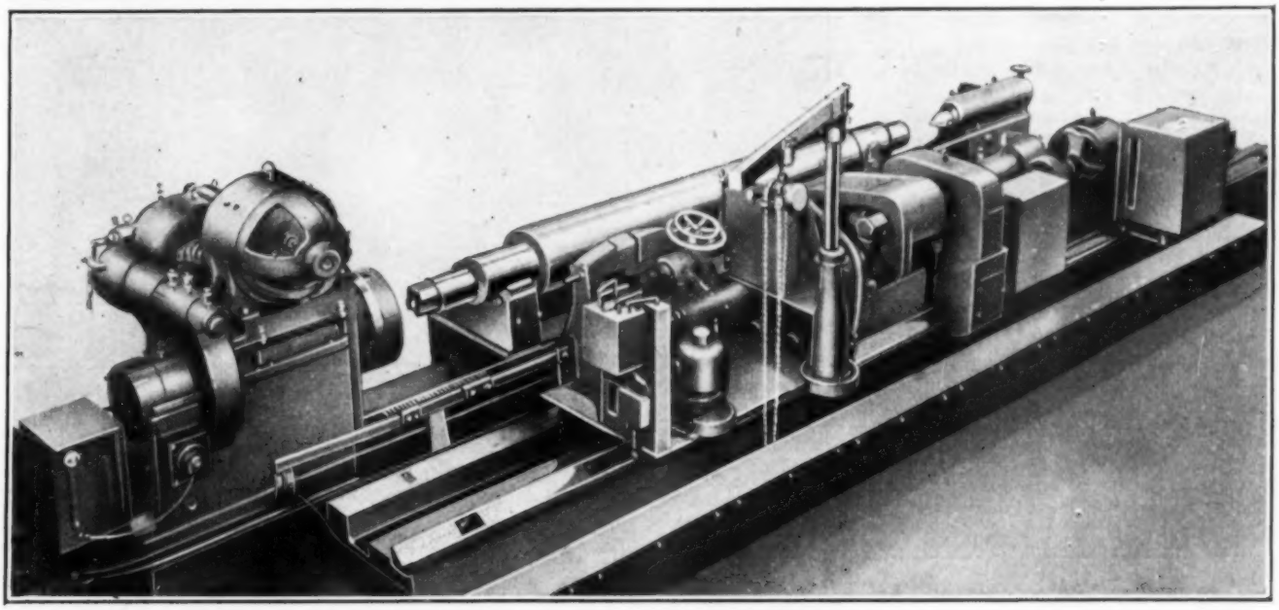


Fig. 1—Norton Roll-Grinding Machine, 54-Inch

wheel and operating the pump. The reversing mechanism used in the earlier models of the Norton type-K grinding machine has been replaced through the use of a 7½-hp., adjustable-speed, reversing motor. Seven traverse speeds can be obtained by means of the reduction box through which it operates. The motor and its control box are located on the wheel carriage and are easily accessible for oiling and adjustment.

The operator's position, shown in Fig. 2, is on the table in a location from which the contact of the wheel on the work is visible. In front of the operator are handwheels for effecting the feed of the wheel and for the hand traverse of the table. The latter is used when locating the wheel at a shoulder. The controls for operating the automatic traverse of the carriage and the power movement of the wheel are also at hand, and on one side within reach is a

boxes 5½x12 in. and 3x9½ in. Roller bearings have been provided under the wheelslide to insure sensitive movement. Flood lubrication for the spindle is provided by means of a pump mounted on the wheelslide, which draws from an oil reservoir having a capacity of 8 gal. Glass bull's eyes on top of the bearings make the flow of oil into the boxes visible from the operator's position.

Two beds support the distinct units of the machine, one the wheel carriage and the other the work. Each bed is made up of three sections which are bolted together, end to end. The grinding compound is drained into the settling tank from which it flows to the pump pit, by means of a channel between the beds. The coolant system has a capacity of about 1,500 gal. A 3-hp., vertical motor is used for pumping the coolant.

The headstock is fixed on the supporting the rolls while grinding the journal bearings.

The footstock can be moved on its ways either by means of a hand ratchet or by a 2-hp. motor. Its spindle has a bearing 10x38½ in., and the spindle center is 6 in. in diameter.

During the grinding operation the roll is supported on a set of two-bearing journal rests, and it is possible to grind the journal bearings while the rolls are supported on the rests. Three-bearing rests can be used, however. Adjustments are provided so that the roll can be aligned in relation to the wheel and so that reduction in the journal size from grinding and from wear on the brasses can be compensated for.

When the requirements necessitate forming of the roll face, an attachment to the regular machine can be used. This device is mounted on a base behind the wheel carriage

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and consists of an adjustable form bar which is presented to a hardened roller on the wheelslide. As the wheel carriage is traversed the form on the bar is reproduced on the roll face.

A hand-operated chain hoist is built on the carriage for use in mounting the wheel. The column supporting the hoist can be swiveled on its base.

The grinding wheel is operated by means of a 40-hp., adjustable-speed motor through a 10-in. belt. A weighted idler pulley is used to maintain a constant tension. Several spindle speeds are available to make possible efficient the operation of the wheel. A wheel 24 in. in diameter and with an 8-in. face has been adopted for use on the roll body. A similar wheel with a radius formed on the corner to produce the fillet is used on the next grinding operation. The diamond radial truing device can be used for radial and face truing. A plain table-type diamond toolholder is also provided.

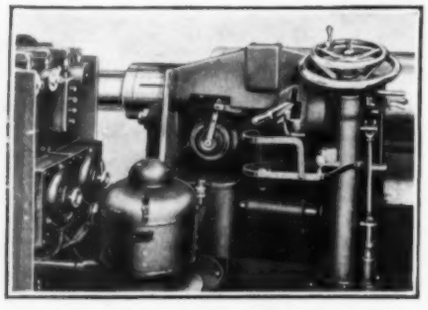
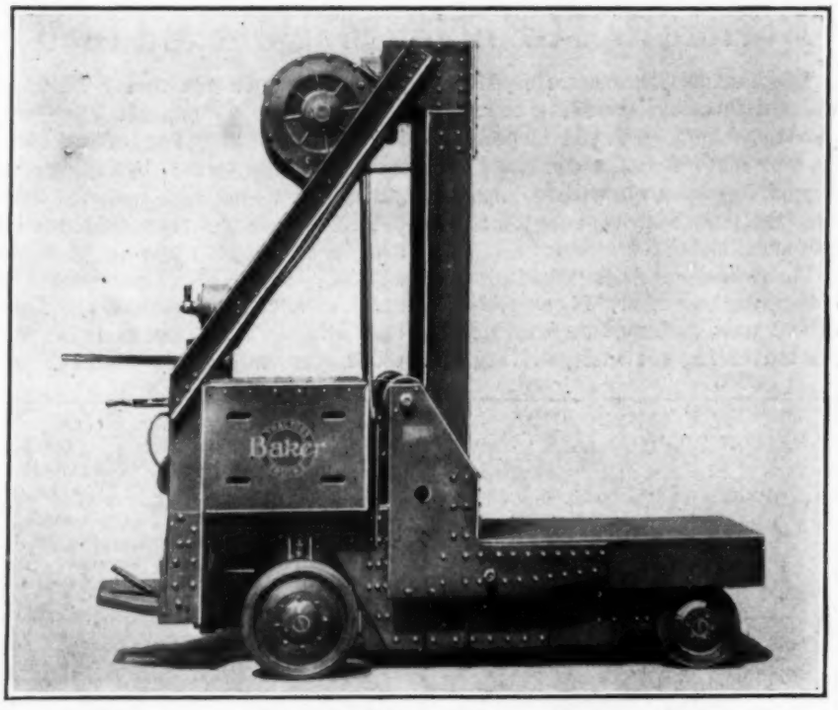


Fig. 2—View of the operator's position

Baker "Hy-Lift" Truck 6-Ton

The 6-ton "Hy-Lift" truck, illustrated, is being marketed by the Baker-Raulang Co., 2180 West 25th St., Cleveland, Ohio, and is an addition to this company's line of similar equipment, part of which was previously described on page 93, Vol. 58, of the *American Machinist*. The truck is intended for use in changing and moving large dies for press work.

The main frame consists of two 8-in. and two 9-in. channels connected by a 1-in. gusset plate. The roller frame is made from four 1-in. plates and the ⅝-in. steel platform is carried by four 8-in. channels. The vertical track on which the roller carriage runs consists of two 8-in. nickel-steel I-beams. The power plant is equipped with a Baker inclosed series motor that drives through worm reduction and full-floating axle shafts. The driving axle is connected to the frame by means of a duplex compensating suspension that relieves axle strains and maintains accurate alignment between the axle and truck frame under all road conditions.



Baker "Hy-Lift" Truck, 6-Ton

The hoist is of the two-cable type and the drums are driven, by means of a compound-wound motor, through a combination reduction of worm and planetary gears.

Engelhard Recording Pyrometers, Type-S

The type-S recording pyrometers manufactured by Charles Engelhard, Inc., 30 Church St., New York, N. Y., represent an improvement over the type-R instruments described on page 1325, Vol. 52, of the *American Machinist*. The pyrometer is illustrated in Fig. 1, and in Fig. 2 is shown a view of the instrument with the cover removed.

The outer case is made up of two castings, the back half, which forms the base of the instrument being made from cast iron and the front half or cover from cast aluminum. A rubber gasket is inserted in the cover to protect the instrument from stray magnetic fields, dust, or moisture. The mechanism is assembled on a sub-base that is secured to the casing by four bolts. The galvanometer system is mounted on the back of the sub-base. Double-thick glass plates are set in the front of the cover and in the cover top.

The galvanometer-moving system responds to the electromotive force applied to the instrument terminals and its deflection from the low-scale division is a measure of the electromotive force which, in most cases, is calibrated directly in terms of temperature. The clock mechanism and the reroll drive the chart at a fixed rate of speed. A depressor bar above the pointer is operated intermittently from the power unit. When the depressor bar is down, the pointer presses the inked ribbon against the chart and records the pointer position. The record is a small dot.

The power unit is controlled from

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a contact switch mounted on the clock. Each time that a circuit is established through this contact switch, the power solenoid is drawn down and drops the depressor bar against the pointer.

The recording chart is of the ribbon type and approximately 100 ft. long. The over-all width of the

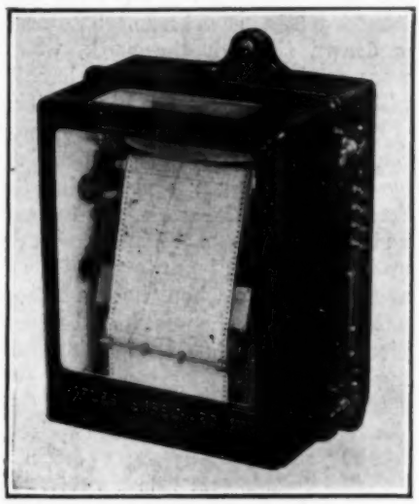


Fig. 1—Engelhard Recording Pyrometers, Type-S

chart is 6¾ in. It is held against the driving drum by a series of rollers that are mounted in a separate frame, hinged so it can be swung outward while the rolls are being changed. The chart can be adjusted to the correct position for a given time reading by turning the driving drum. This drum is connected to the gear train by an adjustable

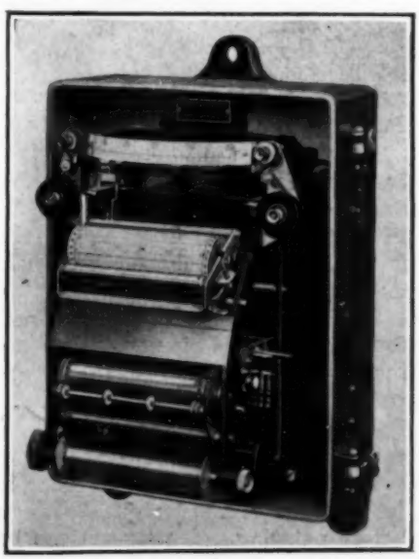


Fig. 2—The pyrometer mechanism

clutch so that the clock gears will not be strained. The printing bar is located so that the record of the instrument can be seen as soon as it is made.

In the case of a single-point recorder, where there is no distinction in color, a one-color typewriter ribbon is used. Enough inking ribbon is provided to last for a period of 30 days, after which it can be used over again. On multiple-point instruments with color distinction, a ribbon 1½ in. in width with parallel color stripes is furnished.

The electric clock for the unit is designed only for alternating current and is of the Warren type, with a gear train. In other cases a spring-motor clock is provided. This is of the 7-day type. It is provided with a stopping and starting lever and also with a time-regulating lever, mounted at the right-hand side of the instrument.

An automatic switch, the operation of which is illustrated in Fig. 3, is furnished on multiple-record instruments. It forms part of the power unit and is mounted in the

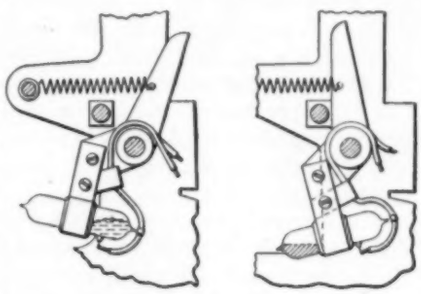


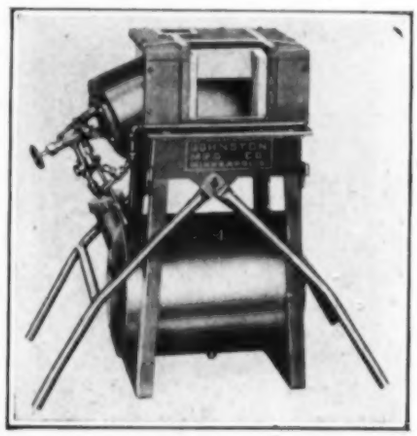
Fig. 3—Action of the mercury-contact switch

same sub-frame. The switch consists of levers mounted on a spindle and spaced from one another. To the lower end of the levers are attached either one or two glass bulbs approximately 1 in. long and ¼ in. in diameter. The bulbs contain a small quantity of mercury protected from oxidation. In one end of the bulbs are sealed two platinum electrodes. They are connected to the terminal post of the instrument by flexible leads. On a single-pole wiring system only one bulb is mounted on each lever. The normal position of the levers is such that the bulbs are tilted and the mercury is not in contact with the electrodes.

Opposite each lever, on a revolving spindle that is connected to the pinion of the power unit, is a stud that throws the lever forward when turned to the right position. This action tilts the switch bulb so that the mercury completes the circuit between the two electrodes.

Johnston Oil-Burning Rivet Forge, No. 15

The rivet forge illustrated has been added to the line of the Johnston Manufacturing Co., Minneapolis, Minn., and is designed so that it can be used for portable service. The charging opening has been placed in



Johnston Oil-Burning Rivet Forge, No. 15

the upper front part of the forge so that the operator can more easily handle the work. The height of the front wall is 2 inches.

A vent is built into the left rear corner of the heating chamber so that a part of the gas discharged can escape by that path instead of through the charging opening. The escape of gas through the charging opening is also controlled by a curtain of compressed air that is forced through holes in the sides of the opening.

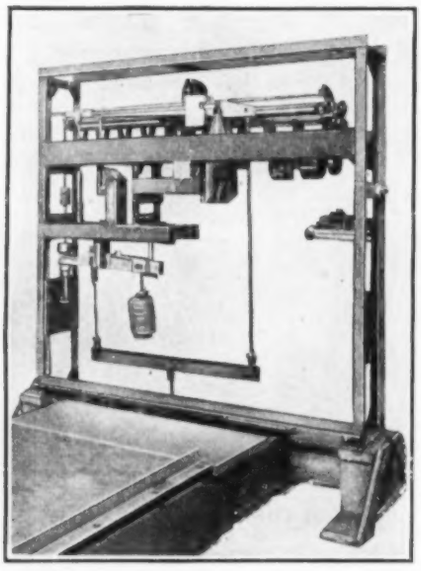
The forge is equipped with the company's vacuum-type oil burner. The oil regulation of the burner is accomplished by means of an air valve that adjusts the vacuum by which the oil is drawn up. The lining of the forge is of fire-brick set in high-temperature cement. It is claimed that the lining of the forge will last until the floor is worn out by the handling of the rivets.

SHOP EQUIPMENT NEWS

Merrick Mechanical Platform Scale "Weighman"

The mechanical "Weighman," illustrated with the dust-proof caging removed, has been brought out by the Merrick Scale Manufacturing Co., Passaic, N. J. This machine is designed to automatically weigh and register loads. The mechanism is adaptable to platform scales, overhead telphers and industrial railways.

The weighing unit consists of a mechanical arrangement for the balancing of the scale and at the same time tallying the weight on the platform. The poise is moved mechanically instead of by hand. The main balancing beam of the scale, which is of the usual type, can be seen in the illustration. Placed parallel to it is a revolving square shaft operated by an electric motor mounted at the right-hand end of the frame. A round drum is free to move axially on the shaft, but it must revolve with it.



Merrick Mechanical Platform Scale, "Weighman"

At a point corresponding to the center of the graduations on the beam is placed a disk having a constant bearing on the drum and placed perpendicular to it when in its normal position. When the scale is unbalanced during operation, the disk becomes tilted in such a way as to cause the drum to move toward a balanced position. The poise weight on the beam is carried along with this movement. When the load is removed from the scale, the weight travels back to the zero point and locks itself.

In order that the workman will not weigh himself with the load, an electrical device has been designed and its switch placed at a sufficient distance from the platform so that the scale cannot be set in operation by the workman while standing on the platform. The switch must be turned to start the mechanism, that unlocks the poise weight.

A printed record of each weighing is made on a ticket or a tape, as desired. The company guarantees a high degree of accuracy.

Silver Portable Electric Saw, No. 895

The No. 895 portable electric saw, illustrated, has been placed on the market by the Silver Manufacturing Co., Salem, Ohio, for use in the woodworking and the pattern shop. It can be used for rip-sawing, mitering and cross-cutting.

The framework of the saw is a combination of iron and seasoned hardwood. Iron casters on two of the legs permit wheeling the machine from place to place. Its motor will operate on an ordinary lamp circuit.

The saw arbor rides in a bearing on the upper end of an A-shaped swinging frame. A chain sprocket on this arbor is driven from a similar sprocket on the main shaft, the latter being mounted on the cross braces for the legs and carrying a 40-lb. flywheel and a gear wheel which meshes with a pinion on the motor shaft.

Silver Portable Electric Saw, No. 895

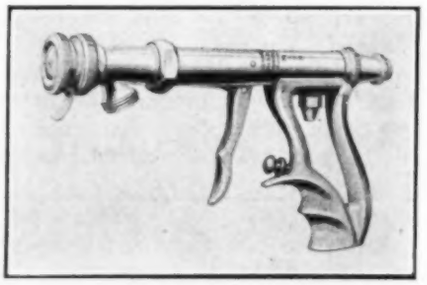
The lower arms of the saw-carrying frame ride on bearings on the drive shaft. This frame has a swing of 9 in. The machine will cut to a depth of 2 in. with the standard 8-in. saw blade. The saw is drawn through the work, when cross-cutting, by means of the handle which can be seen in the illustration.

For ripping work, the saw frame can be locked in an upright position by means of a pin, and the handle thrown back. The work is fed along a ripping gage into the blade. Work up to 2x4 in. can be mitered with an angle of 45 deg. when the graduated miter gage is being used, and wider pieces can be handled with the sliding miter gage.

The top of the table is 28x30 in., the height is 36 in., and the weight is 180 pounds.

Paasche "Multiplehead" Air Brush

An air brush or paint sprayer with an interchangeable, combination round, revolving, floating and adjustable fan-spray air-brush head has been placed on the market by the Paasche Airbrush Co., 1909-1923 Diversey Parkway, Chicago, Ill. It is designed primarily for use with lacquer but will handle paint.



Paasche "Multiplehead" Air Brush

During use, the crescent-shaped fan with balanced air ports and with the round air cone cap is said to prevent a split or an uneven spray. It floats into alignment with the fluid valve plunger, to prevent leakage.

The arrangement permits using a jet of air for dusting off the work before painting. The stream can be reduced to a fine line or to a spray.

News of the Week

French Machinery Industry Affected Adversely by Domestic Difficulties

Lack of sound finance, high cost of living and burdensome taxation all add to uncertainty of future

The trade situation in France today is dominated by finance, taxation, cost of living, inflation and stabilization. The array of elements which may make for good or bad is formidable. The Bank of France again increased its note circulation a hundred and fifty million francs the last week and further advanced a credit to the government of a billion and a half, of which the state treasury immediately absorbed some three hundred and fifty millions and ten days later had used it all up. By law the note circulation, now at 48 billion francs, can only be increased another one and a half billions, which, with a like amount to the credit of the government, reaches the ceiling of 51 billions allowed by law. Further legislation, which may be asked of the present parliament by the new cabinet, may, and probably will, increase this by something like another 8 billions. The government is now indebted to the bank for some thirty-three billions, which will doubtless be 40 billions before long.

The fall of the second Painleve cabinet and the reconstitution under the leadership of Briand, brought about (by the rapid depreciation of the franc and Painleve's scheme for consolidation of government loan's which the public manifestly did not want) what in a few words may be called an exceedingly dark fortnight. The dollar rose to 26.90 francs, with one exception, when it went to 27 a year and a half ago for a few hours, the highest ever known. The franc recovered virtually 10 per cent forty-eight hours afterwards, but is again falling as a result of the new proposed inflation.

Favors Big Business

Monsieur Loucheur's arrival in the new cabinet as minister of finance was not wholly unlooked for, but taking the policies of the parliamentary left wing for what they are it is difficult to anticipate any very encouraging support of his plans to improve the financial situation. Monsieur Loucheur represents big business, which alone is sufficient to account for any socialistic and radical antipathies which may supervene. He is allied with innumerable electrical industries and scarcely less with the metal transforming and mechanical trades. There are those who foresee in this an imminent attack on imports of manufactured goods, supposing that he listens to the suggestions of his widely diffused industrial constituency—manufacturing and banking interests alike.

Two fellow cabinet ministers have paved the way for something to come by exhorting the public to meet the new sacrifices, reminding them that the day of great penitence has arrived. Meantime big business wonders how it will be affected and the small investor and property holder knows that he is being taxed to his possible capacity at present.

Monsieur Loucheur's pet project was the settling of international debts by a wise distribution and exchange of products and manufactures, something which in no way will endear him to the American workingman or manufacturer. On his arrival to power his first suggestion, later incorporated into his finance bill, was for a currency inflation of a further possible eight billion francs, which at least as a money of circulation, even of such low potential value as it represents, will help trade temporarily.

Iron and Steel Firm

Iron and steel, both in bars and billets, are firm with little change from an appreciable tendency to rise during the past month or six weeks that the financial crisis has been at its most acute stage.

The machinery, automobile and fabricating trades in general have held off on orders, though their near prospective needs are proportionally the heaviest of the year. Orders offered at the moment are not too keenly sought by steel plants at present prices, caused in part by orders on hand and again by an indisposition to book others at speculative prices without knowing the trend of the new government financial and foreign policies. More than in any country on earth, government problems and those of private industry here are closely linked together. The export situation is virtually identical in the final analysis. Long date deliveries for home or abroad at fixed prices of the day are not generally sought.

Complaint is made by export manufacturers of tools, machinery and automobiles that more and more they are feeling the effects of the competition of manufacturers of other countries, and likewise of high protectionist tariffs in many markets to which previously they had comparatively easy access. In general, so far as automobile and parts go, this observation refers to Great Britain which is now about as tightly walled by a tariff as the United States. The competition referred to otherwise is doubtless that of Germany which is placing its moderate priced tools and machinery, even in the French home market, to an extent that was not anticipated a year or more ago.

Tool steel, electric steel and other alloy steels, so far as they play any considerable part at all, are meeting with generally satisfactory call in the home market as well as for export to the Near and Far East where, it is not to be denied, France has been gaining ground of late.

Welded tubes are in active demand, the home market, however, absorbing the production. Nuts and bolts are rising in price by the naïve procedure of reducing discounts from list.

Railroad Equipment Active

Locomotive and rolling stock plants have recently been asked for bids by the Czecho-Slovak State Railways and by the Egyptian Ministry of Transport, The great French trunk line railways are preparing their 15-year program under which they will add considerably to their equipment. Effects will come into being from 1926 onward, bearing in mind that the great development will be in the electric locomotive and other electrical equipment. This will be the big prize for such plants as are equipped for its output.

The small metal trades producing castings, forgings and stampings in various metals are active but those turning out railway carriage hardware and fittings complain that orders have fallen off. The tool trade has almost universally raised prices during the past month with little prospect of any change unless it be another rise. The cost of tool steel is given as the cause. A continual rather than an intermittent raising of prices is not conducive for distributors or dealers to stock up at this time.

Many items in a hitherto long list of metal manufactures are being weekly curtailed in volume according to import statistics. Saws and files are in this category while France herself is increasing her export thereof, the former the first nine months of the present year being sent out of the country to the volume of 452 metric tons, an increase over 1923 figures. Doubtless the above observation applies to some extent to tools and machinery or parts of American or British manufacture, brought about by the steady rise of the value of dollar and sterling exchange which may be said to have closed the market on many items. Finer grades

of precision and machine tools have been less affected but it is obvious that the handicap on certain other lines is serious, perhaps insurmountable, under present franc values in relation to the dollar.

There is still a live protest against the admission of German made agricultural tools and machinery on reparations account for the northern departments. The Department du Nord has taken 60 million francs worth and the total for the reconstituted departments is claimed to be 150 millions which is just so much business lost to the order-books of the French manufacturer if we except that portion which would ordinarily go to American manufacturers. How interesting from a price point of view the situation may be for the American manufacturer in these lines is indicated by the statement that the French maker can sell a reaper and binder at 4,500 francs, practically a thousand francs under the German figure, that product paying only a tariff charge of some two hundred francs under the minimum régime. The sidelight of this is that France is obviously making great strides in this line, proved once more as well by the fact that nine month's exports of agricultural machinery during the present year was running nearly nine thousand metric tons a month. Meantime Germany is attacking France in her home market under the provisions of the reparations act.

The labor market, according to the figures of the government labor bureau, has absorbed all but 517 male applicants and 53 female applicants during the past month. During the second week of November there were twelve thousand inquiries for work, apparently all taken care of. So far as the metallurgic and the machinery industries are concerned employment and demand have virtually balanced. Given production and trade conditions for what they are this presents another of the anomalies of French economic conditions of the time. Foreign labor to the number of 2,665 was placed during the same week, largely in the mining and metallurgical industries.

Labor troubles have been trifling but an affiliated American firm in France making heating appliances suffered a strike of some days in its foundry plant at Dole in mid-France.

The heavy metallurgical industries of the north have to some extent turned out surplus labor, of which the Belgian contingents mostly went across the frontier and others have been absorbed by agriculture and the beet sugar industries so numerous in the region.

Distribution Prcblems Discussed at U. S. Chamber Conference

Business ethics, the means of collecting distribution statistics, and the effect of legislation on business were among the important topics discussed at the second Distribution Conference called under the auspices of the Chamber of Commerce of the United States. At the meetings, which were held in the main hall of the chamber headquarters in Washington on Dec. 15 and 16, reports were presented by six committees as follows: Committee I, "Collection of Business Figures as a Means Toward Accomplishing Economies in Distribution"; Committee II, "Trade Relations"; Committee III, "Market Analysis —Advertising and Advertising Mediums"; Committee IV, "Expenses of Doing Business"; Committee V, "Methods of Distribution"; Committee VI, "General Conditions Affecting Distribution." The respective committee chairmen were Owen D. Young, chairman of the board, General Electric Co.; A. Lincoln Filene, general manager, William Filene's Sons Co.; Stanley Resor, president, J. Walter Thompson Co.; Robert R. Ellis, president, Hessig-Ellis Drug Co.; Dr. L. D. H. Weld, commercial research department, Swift & Co.; Gabriel S. Brown, president, Alpha Portland Cement Co. The committees were made up of from 25 to 50 prominent business men of the country.

The reports are extensive and represent a large amount of hard work. Among the recommendations contained in them were these: That an exhaustive study be made of our present sources of statistics on distribution, classified by commodities, by source, and by character; that the work of various statistical agencies be co-ordinated; that a joint trade relations committee be formed to establish a clearing house for complaints of unethical practices; that a market research planning body be established to eliminate duplication of effort; that the need for uniform classifications of accounts and studies of the cost of doing business should be brought to the attention of all engaged in distribution; that a permanent organization be established to explain distribution processes to the people; that the present improved procedure of the Federal Trade Commission be made mandatory by legislation; that the Department of Commerce be urged to promote the simplification and uniformity of weights and measures as used by the various states.

Steel Treaters Meet

More than one hundred representatives from large industrial companies in Indianapolis attended the Christmas banquet of the Indiana chapter of the American Society for Steel Treating, held last week. Alexander H. D'Arcambal of Hartford, Conn., metallurgist of the Pratt & Whitney Co., delivered the principal address. "Without steel, civilization could not exist," he declared. "Every industrial concern uses it in some form or other." Treatment of steel and the types used in construction of various automotive parts, together with the composition of smaller steel tools, was discussed by the speaker. He said the steel industry was in a healthy condition. Clarence H. Beach, secretary and treasurer of the society, made his annual report.

Will Study Use of Permanent Molds

Of especial interest to foundrymen planning to attend the Second International Foundrymen's Congress to be held in Detroit the week of Sept. 27, 1926, will be the symposium on permanent and long-life mold castings. This phase of foundry practice which has assumed such importance in the past few years will be thoroughly discussed.

The Cothias and similar processes used in England and France will be explained. The American practice developed in using oil-cooled molds for pistons, the process of using zinc impregnated molds and the many other special developments in iron, steel and non-ferrous fields will be considered.

The committee organizing this symposium under the direction of Jesse L. Jones, metallurgist, the Westinghouse Electric and Manufacturing Co., will welcome information from any who have been instrumental in developing or carrying on work in this field.

Foundrymen Meet

W. A. Hummel, hoist engineer, was the principal speaker at the 350th dinner meeting of the Philadelphia Foundrymen's Association, held in the Manufacturers Club, Philadelphia, on the evening of Dec. 8. Mr. Hummel delivered an illustrated talk on electric hoists, stokers and compressors.

Dr. Howard D. Evans, of Philadelphia, made a brief address in which he explained the American view of the World Court.

Following these speakers the meeting was thrown open to a general discussion of the 1927 Foundry Convention which will be held in Philadelphia next year. S. G. Flagg, Jr., of the Stanley G. Flagg Co., outlined the details as arranged up to the present and intimated the duties that will fall to the local organization.

Southern Metal Trades

A special meeting of the Carolina Division of the Southern Metal Trades Association was held at Winston-Salem, N. C., Wednesday, Dec. 9, at the Robert E. Lee Hotel. Members of the association attended from all sections of North and South Carolina. Manufacturers present expressed themselves as well satisfied with industrial conditions in the district and freely predicted that 1926 would prove one of the best years for the metal trades industries.

Patent Not Infringed

The decision of the Court of Claims that the Navy Department did not infringe patents of Harry B. Stilz for apparatus used in connection with oil burners, and that he is not entitled to any payment from the Government was upheld on Nov. 16 in a decision rendered by Justice Butler for the United States Supreme Court. There was no evidence, the Court of Claims held, that any burners with Stilz' attachment had been made by or for the Navy Department, and in this view the Supreme Court concurred.

British Machine Tool Trade Better

Unemployment figures show decline—Electrical group busier than many others—Railway shops provide business for machinery builders—Automobile industry buying for expansion—Standard tools in greatest demand

By Our London Correspondent

FOR a short period an improvement has been experienced in the industries of Great Britain, but the increase in the volume of trade has not been very great. Nevertheless it must be said that the general feeling has for quite a time been more hopeful. The best evidence available of the improvement is provided by the declining figures of unemployment, though the lessening of the number of persons on the register is not completely accounted for by trade improvement. More women, too, have found work than men.

In the engineering industries, the electrical group has been most steadily employed, and in the radio business, which is of considerable importance now and is regarded as in a stable condition, there has been nothing more than seasonal fluctuation. The cable and telephone firms have long been profitably employed and in the heavier branches of electrical engineering all signs suggest a continuation of present conditions, and if the unification of periodicity of supply of alternating current is carried into effect any possible small anxiety as to the future must be completely relieved.

There is even a faint flicker in shipbuilding, but nothing more, and on that side the machine tool industry can hope for very little at present. Textile machinery makers have recorded improvement, particularly as to export trade, and something is anticipated from the growth of the artificial silk industry.

The railway shops have not been ordering as frequently as the machine tool world would like, but for heavier equipment in that industry they have remained the best customers. Evidence of this may be seen in the case of one well-known firm of fair size, the customers of which in pre-war days were mainly ordnance firms, arsenals, etc., and shipyards, the firm having just a footing in railway shops. An analysis of the figures for the last completed financial year shows that more than 98 per cent of the value of orders received was from locomotive, carriage and wagon shops.

The automobile industry, though not uniformly prosperous during the past year, has been maintained unusually well and has again proved a good friend to the machine tool builder. Extensions are being made in preparation for the spring output. The acquisition by an American firm of a British automobile company, and the proposed acquisition of another, led to much comment. In some of the motor car firms available capital is scanty, and machine tools for the new program have been obtained on the hire-purchase system, a system, by the way, on which it is understood a considerable proportion of automobiles are now bought and sold here. The practice is perhaps even more common in connection with motorcycles.

As a result of these general conditions the machine tool industry itself is very unequally occupied. In the Midlands, where to the largest extent automoblies are manufactured, the machine tool shops have little cause to complain, and a number of cases can be found where overtime is necessary. In this district a shortage of skilled men is experienced, the motor car firms forming one of the channels by which they have been diverted, and special efforts have been necessary to add to the working forces. On the other hand, the farther north one proceeds the less active do the machine tool shops become. In Scotland the whole engineering industry is dull. In two more instances (both well-known English machine tool firms) a relatively short time limit has been placed on the existence of the shop unless a profit can be shown in the interval. But even in the less fortunate districts hope has been springing into life again.

Woodworking machinery firms are almost as irregularly engaged, and while some manufacturers of lifting appliances are quite fully occupied, others have difficulty in keeping the works running.

For some time a few firms have received good orders for turning machinery, particularly semi-automatic and capstan lathes. Milling machine firms too have found orders and grinding machines have been called for. Some makers of presses have gone on overtime; others have been less fortunate. Among some other classes of machine tools slackness has prevailed, and it is generally the relatively small or medium-sized machine tool that has been required. Some return has been shown on tools of a more standard character, with attachments, in place of special manufacturing machines.

Canada's Automotive Export Trade Is Growing

Canada's export trade in automobiles, auto trucks and auto parts, is in a flourishing condition, according to figures published by the federal department of statistics. During the t elve months ending in October, Canada exported autos and auto trucks to 53 countries and colonies. While the greater part of this export trade was to Great Britain and the dominions, yet there was a substantial trade to continental Europe, Japan, Egypt and most of the South American countries.

During the twelve months under review, Canada exported 45,194 automobiles valued at $23,109,331, while for the corresponding period ending October, 1924, there were exported 52,903 cars valued at $25,168,869. During the same period the exports of auto trucks were valued at $5,016,494 and of auto parts at $5,573,875.

For automobiles valued at $500 and less the chief market was Australia, while for autos valued at from $500 to $1,000, Canada's best market was Great Britain, with Argentina and New Zealand next in importance. Great Britain was also the best market for automobiles valued at over $1,000, while the next in order were Germany, Argentina and New Zealand. For motor trucks, the readiest markets were found in Australia, British India, South Africa, New Zealand and Dutch East Indies.

During the same twelve months Canada imported from the United States motor vehicles and motor parts valued at $33,353,156. Freight automobiles imported numbered 1,073 valued at $1,526,057; passenger autos, 8,320 valued at $12,260,169, and auto parts, $19,567,030.

Gas Manufacturers to Meet in New York

The Compressed Gas Manufacturers' Association will hold its thirteenth annual meeting on Jan. 25, at the Hotel Astor, New York. The meeting will be followed by the annual dinner in the evening of the same day.

This association represents manufacturers of industrial gases, such as acetylene, ammonia, carbonic gas, chlorine, hydrogen, nitrous oxide, nitrogen, oxygen, sulphur dioxide and various hydrocarbon gases. These gases are used for isolated lighting and heating plants, in the fabrication of metal by means of the welding and cutting torch, for mechanical refrigeration, for carbonation of beverages, for bleaching in the textile and paper industries, in the purification of water and sewage by chlorination, as anaesthetics, in fire extinction, and for various other purposes.

The value of compressed gases consumed in the United States yearly is now estimated as at least $60,000,000.

In co-operation with the Bureau of Explosives representing the Interstate Commerce Commission, the association will study the technical problems of economical gas transportation and safe and efficient transportation containers. John H. Luening is secretary of the association, which has offices at 120 W. 42nd St., New York.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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HAVING visited three of the land boom areas in Florida, I feel justified in saying that a collapse is not likely to occur this winter.

The crowd already in the state is being swelled by newcomers each day and by January a huge multitude will have arrived. Many of them have come, or are coming, to buy land, and the demand in prospect will probably be sufficient to sustain values at least until spring.

As my only purpose in making the trip was to ascertain how far the extraordinary speculation was a menace to general business, I shall not express an opinion in regard to the permanence of the movement. All precedents indicate that it will end sometime and that a reaction will follow, but the end is not in sight as yet, and the lavishness with which the Florida realtors are advertising their various projects creates and inspires an optimism that has become infectious and almost epidemic.

The one thing to be feared is self-strangulation. Some newspaper men claim that 600,000 people who arrived in Florida by automobile are now living in tents, and the roads are still congested with motors, while the railroads are so overtaxed that the badly crowded trains are nearly always late.

Hectic efforts are being made to construct accommodations for the oncoming horde of visitors. At Key West three steamers that brought cargoes of lumber from the Pacific Northwest were being hurriedly unloaded in an effort to provide the building material needed at Miami. Mechanics and skilled laborers can get almost any wages they choose to demand, but the embargo upon certain classes of incoming freight that the railroads have been compelled to declare is hampering new construction. Thus, it is quite possible that many of the late arrivals will be without a place to lay their heads.

It is this complacency that makes me think that what is really an amazing development will sustain itself through a winter that seems like summer to those who are in Florida.

The hegira is really most impressive. I doubt if anything like it has been seen since Peter the Hermit led the first crusade across Europe. But most of the crusaders had to walk, whereas those who are coming to Florida travel by automobile or in Pullmans, and one enthusiastic real estate man insists that they are bringing with them an average of $1,000 apiece for investment. If this be true, and it is not such a wild guess, the boom will continue to boom during the winter, unless some unlooked for cataclysm elsewhere checks it.

But as I would not be understood as advising anyone to buy land in Florida, I should perhaps add that an advertisement that I read in a Miami paper has a strong appeal for me. It was published by a real estate promoter who said he had a reputation for getting his clients "out as well as in."

Something of a sensation was created last week in New York's building industry when two prominent experts warned that the present rate of new construction threatens disaster. They stated that a survey of loft vacancies from Canal St. to 42nd St. made last March showed even then 11,200,000 sq.ft. of vacant space, as compared with a surplus of only 5,000,000 sq.ft. a year previously.

Colonel Ayres, of the Cleveland Trust Co., calculates that 419 new apartments have been built in New York for every 100 families added to its population during the past two and a half years. These figures speak for themselves as heralds of decreased building activity and declining realty values next year.

Despite such forebodings, trade for the present continues highly satisfactory, while all signs point to a record volume of holiday business. A boom in railway shares has been on in the stock market, which is partly attributed to a renewal of merger excitement and partly to the recent decision of the Federal Court in Los Angeles in favor of the Los Angeles & Salt Lake R.R. Co. This decision, which enjoined enforcement of the final valuation of the Interstate Commerce Commission as being below the true value of the property, may add billions to the value of railway securities, if sustained by the Supreme Court.

A slight let-up in the activity of the iron and steel industry is reported, which may be seasonal and may be due to the increased importations of foreign metal. Copper, tin, lead, and zinc, on the other hand, have turned upward again, chiefly as a result of a better European demand.

The movements in the speculative commodity markets have been mixed, although the advances have outnumbered the declines. Cotton has sagged under a continued heavy movement while spinners are well supplied, but most of the bearish news is now known and must be nearly discounted.

The upward movement in wheat was resumed again last week. Crop damage reports from the Argentine still dominate the market. Oats and rye were stronger in sympathy, but corn was dull and relatively unchanged. Sugar also has given fresh evidence of strength.

Our foreign trade figures for November as announced by the Department of Commerce show a favorable trade balance of only $70,000,000 as against $197,000,000 for November, 1924. The change is due to a decline of $45,000,000 in the value of exports, and a gain of $82,000,000 in imports.

The weekly statement of the Federal Reserve Banks shows but little change. Gold holdings declined $20,000,000, and bills discounted fell off $60,000,000. The combined reserve ratio now stands at 68.7 per cent as against 69.4 per cent for the preceding week.

What's Doing in Industry

Contrary to expectations, machine tool sales continue to go ahead, even at a time in the year when holidays and annual inventories cause a temporary interruption in industrial activity. The increase in the number of inquiries has been noticeable, and leaves the impression that immediately after the first of the year, expansions will take place in many large plants and machine tool and machinery sales will benefit accordingly.

The New York market experienced a slight change for the better in the past ten days, new orders becoming more numerous. Down through the Southern territory sales are brisk, and inquiries are more plentiful. Philadelphia reports prospects bright.

Detroit sees no noticeable change in conditions, automotive sources still providing orders for new equipment. Cincinnati reports a fair demand for tools, automotive and railroad customers doing the buying. Chicago sales are increasing slowly and machine tool plants are well employed. In Milwaukee manufacturers are busy filling present orders, but new orders have not shown any increase.

Despite a few foreboding signs, trade for the present continues highly satisfactory and all signs point to a record holiday business. The stock market is firm, with railroad shares on the boom.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Cincinnati

Machine tools have moved fairly well during the past week, according to reports of Cincinnati manufacturers. There has been less dullness than is usual at this season, and there is confidence that the business trend will continue its upward course.

Selling agents report that while there is now the usual seasonal tendency to postpone purchases until after the first of the year, there has been a fair demand nevertheless. There is every indication of a good volume of sales after the first of January, with a progressive increase in demand.

Orders received have been well diversified as to sizes and types, and they have been well distributed geographically. More sales have been made to the automotive industry than to others. The railroads have done some buying of single tools, but large purchases have been postponed until after the first of the year. General machinists and industrial users of machine tools have bought a considerable number of single tools, most of these being replacements.

The general feeling among manufacturers and selling agents is decidedly optimistic, the consensus being that 1925 is drawing to a satisfactory close and that 1926 bids fair to start off with an increased demand which will continue to grow.

Philadelphia

Business conditions throughout the Philadelphia area continue on an economically sound basis, with prospects of continuing toward a greater volume. Machinery and machine tool establishments reported somewhat less in prospect now than they had anticipated from earlier inquiries, but there was nothing disquieting in the present situation.

Firms engaged in machinery repairing and in the sale of used machinery, report a considerable advance in their activities since early in September. Repairs to steam engines and ice making machinery has been in particular demand.

Manufacturers of gears report a substantial business activity, with inquiries indicating a continued volume. The business is well distributed over a wide area. The employment situation is normal.

Southern District

While tool and equipment sales with Southern dealers have continued fairly brisk the first part of December, business is declining somewhat as the holiday season sets in. Inquiries, however, are reported unusually brisk for this time of the year, in sufficient quantity to indicate that there will be a heavy volume of tool and equipment buying after the first of the year.

The outlook for the early part of 1926 is particularly good, dealers state, for contractors' equipment and road building machinery, as all indications promise another big building year in the Southeast, and an even larger amount of new road construction than was carried out in 1925.

The outlook is also good for woodworking machinery, textile plant equipment, brick machinery and machine tools used in automotive service stations.

Railroads are still buying to some extent in this district as there is quite a bit of shop construction still going on. The textile and woodworking industries are buying fairly well, but not as heavily as they were last month. Little buying is being done right now by service stations or smaller machine shops, but inquires are fairly good from both these sources, and sales are therefore expected to pick up considerably early in 1926, as production schedules get under way.

The South being in good shape financially and industrially, nearly all dealers seem confident that the first quarter of 1926 will establish one of the best records for this period they have ever experienced in the Southern district.

Chicago

Dealers in machine tools, with a few exceptions, report business conditions as fairly active. Compared with the first half of November, there is only a slight difference in the volume of trade up to Dec. 15, the difference being in favor of last month. Wheels and grinding machines continue in good demand, many orders for grinding wheels being entered for future delivery, a few as far in advance as June, 1926. This is regarded as a good augury for next year's machine tool business, to which dealers are looking forward with the greatest optimism, based on steadily increasing factory production and the building of new plants in Mid-West states.

Manufacturers' agents in Chicago, more especially those representing millers, shapers, lathes, gages and small tools, are well pleased with present market conditions in this territory. Deliveries of new machines continue slow, notwithstanding that several plants are working double shifts in order to gain headway. William Sellers & Son, Bucyrus, Ohio, the International Harvester Co. and the Miehle Printing Press Co. placed orders for a number of tools within the last two weeks. Railroad buying is negligible.

An advance in price of 5 per cent for milling machines was announced early this month. Inventory taking has started with some local dealers; others will begin stock taking prior to January first.

Detroit

Although inventories are scheduled in a number of the automobile plants in Detroit and surrounding industrial centers, no material change has been noted in the sales of machine tools and machinery.

There is an apparent rush on the part of the manufacturers to purchase grinding equipment. This much one gleans in talking to leaders in the industry. At the same time more is being done in the way of perfecting cylinder finishing machinery than ever before. The Society of Automotive Engineers at its meeting on Dec. 17 spent the entire evening in hearing the question of cylinder-finishing discussed. According to machinery men the engineering staffs of the motor car plants have felt that the finishing of cylinder bores has never reached the point of perfection to which it is possible to attain.

The demand for gear-cutting machinery is also very good. At the close of the annual inventories there will be an increase in sales of such tools as dies and reamers.

Some of the automobile manufacturers are awaiting the national automobile shows before ordering much of the equipment they will probably need in turning out the number of cars which they will produce in 1926. The reaction to these shows will go far toward determining the market for machinery during the first quarter of the year.

All the body plants in Detroit are working full time. The Briggs Manufacturing Co. is planning an extensive addition to its die room to care for the increased demand.

Packard is still buying automatic machinery to replace all antiquated equipment. Cadillac is also ordering new tools and machines for next year.

New York

Business in this market showed a slight improvement in the past ten days. New inquiries appeared from more than one unexpected source and sales closed within the week were quite satisfactory in volume.

Among the equipment ordered were: A 10-ton crane, a 36-in. planer, 7 geared-head lathes, a vertical shaper, several automatic lathes, 3 jig borers, 4 vertical surface grinders and several thread millers.

Special purpose machines are still in demand, although most orders are for single pieces.

The Lehigh Valley R.R. has asked for revised quotations on a list sent out some time ago. The General Electric Co. is also reported in the market for several machine tools. Few new railroad inquiries have appeared in the past week.

Milwaukee

While all of the machine tool plants in this territory are busily engaged in executing orders and striving to meet the pressure for delivery being exerted by customers, new business is showing some decline. However, this is accepted as the usual development of the season of inventory and holidays. The lessening of buying activity set in after the first week in December, at which time the automobile trade particularly began its inventory period. There seems to be every reason to believe, however, that immediately after the opening of the new year purchasing of equipment will be resumed on a very satisfactory level.

In metal-working shops, employment is maintained at a substantial advantage over any time this year, and the number at work is averaging close to the previous high mark reached in the spring of 1923. Some tool plants are not able to procure all of the skilled men needed to keep operating and production schedules up to requirements of orders and delivery specifications, but the labor turnover is not exceptionally heavy, there being little evidence of bidding higher wages as between various local shops, which makes for excessive turnover.

The trend of demand, especially from the automotive customers, still runs heavily toward special tools for special uses. Makers of milling machines, on the other hand, seem to have met this trend quite well in designing their most recent tools or the variety of appliances to fit standard types and still meet special purposes. Makers of other classes of metal-working machinery are also profiting from this development, and the market is broadening correspondingly.

Stocks of used tools are reported to be moderate. Large auction sales disturbed the market for a time, but high prices for this class of equipment has aided the sale of new machines.

Personals

B. J. MINNIER has resigned as vice-president and general manager of the New York Air Brake Co.

L. C. DECKARD, formerly with the Motch & Merryweather Machinery Co., is now associated with the Laughlin-Barney Machinery Co., of Pittsburgh.

J. B. BEATTIE has been appointed Eastern sales manager for the Lapeer Trailer Corporation. His headquarters will be in New York City.

JAMES P. WELCH has severed connections with the Berry Automatic Lubricators Corporation, of Newark, N. J. He has been succeeded by W. A. Cawley.

C. C. CHESNEY has been nominated for the presidency of the American Institute of Electrical Engineers. He is general manager of the General Electric Works at Pittsfield, Mass.

J. N. WALKER has been appointed general sales manager of the Oxweld Acetylene Co., of New York. L. D. Burnett has been appointed Eastern sales manager and Z. T. Davis has been named to assist Mr. Burnett.

GEORGE K. SCHIELDGE, formerly manager of the Stacy Machine Works, Springfield, Mass., has opened a shop at 83 Laurel St., in Hartford, where he will do all kinds of tool and contract work.

J. M. WASHINGTON, formerly works manager of the Frank Mossberg Co. of Attleboro, Mass., has been appointed senior vice-president of the newly organized Frank Mossberg Corporation of Attleboro.

JAMES W. SNEYD has resigned as manager of the die department of the National Acme Co., of Cleveland, and has become associated with the Geometric Tool Co., of New Haven, Conn.

WALTER H. STEPHENS, consulting and designing mechanical engineer, has established offices at 539 Monadnock Bldg., Chicago. He will specialize in material handling equipment.

J. F. HEMENWAY has retired from the Smith & Hemenway Co., Inc., of Irvington, N. J., manufacturer of tools. His entire interests have been purchased by Landon P. Smith, president. Mr. Smith will continue in the active management of the business as heretofore.

E. A. HURME has recently been appointed manager of the electric furnace section of the industrial heating division of the Westinghouse Electric and Manufacturing Co. Mr. Hurme was formerly manager of the steel mill section of the industrial sales organization.

HENRY D. CARLTON, vice-president of Manning, Maxwell & Moore, Inc., formerly in charge of the steam specialties department, has now assumed charge also of machinery and crane sales. Thomas S. Stephens has been appointed manager of railroad sales of the machinery department. Wm. D. Clarke has been appointed general sales manager of the crane department.

FREDERICK V. LINDSEY has been appointed sales manager of resistance materials for the Driver-Harris Co. Mr. Lindsey has been identified with the manufacture of nickel and nickel alloys for a great many years, having been vice-president of the Electrical Alloy Co. previous to its purchase by the Driver-Harris Co. His efforts will be concentrated in his new appointment on the manufacture and sale of "Nichrome" for industrial and domestic applications.

W. J. NUGENT, vice-president and general manager of the Nugent Steel Castings Co., of Chicago, has been elected president to succeed Charles Piez. Prentiss Coonley has been elected vice-president and C. A. MacDonald, secretary, has been elected to fill a vacancy on the board of directors. Mr. Nugent has been associated with the company since 1918, when the present plant was erected. From 1918 to 1921 he served as vice-president and in 1921 became general manager as well. The interests of Mr. Piez have been taken over by Mr. Nugent and others.

News of the Automotive Industry

The Franklin Automobile Co. in the past five months, exceeded the volume of business done during the corresponding period in any of the past six years, including the periods when the industry reached previous highs, according to factory sales manager S. E. Ackerman. Retail sales of the air-cooled car in November exceeded those in October, it also was learned.

Dodge Bros. Inc., is planning a reduction in prices on its complete line of cars, effective Jan. 7. Reductions are made possible by the $10,000,000 expansion in plants which includes new buildings and equipment and will nearly double capacity of the factory in 1926. It is understood the price reductions will range from $50 to $200.

The sales of General Motors cars by dealers to users in November totaled 60,371 cars and trucks, compared with 33,095 in November, 1924. Sales of cars and trucks to dealers by the manufacturing divisions of General Motors in November totaled 73,624, compared with 23,631 in November, 1924.

The Ford Motor Co. closed a contract last week for 10,000 Fordson tractors with equipment, plows and spare parts, to be sold to the Russian government for an aggregate amount of $6,000,000. News of the contract was given out by the Amtorg Trading Corporation, 165 Broadway, purchasing and selling agents in this country for the various Soviet industrial and commercial organizations.

Shipment of the tractors will be made in time for them to reach the agricultural districts of Russia for the next spring work. These shipments will be to the ports of Novorossisk and Odessa during December and January. It was said yesterday by officials of the Amtorg Trading Corporation that special schools would be held by the Soviet Union during the early spring throughout all parts of rural Russia and that the peasants at the schools would be taught to use the tractors which have been purchased from Ford.

What the Railroads Are Doing

The Louisville & Nashville R.R. has contracted with the Pressed Steel Car Co., of Pittsburgh, for 1,000 all-steel gondola cars of the same type as the 1,500 now under contract, delivery to be accepted at the rate of 25 to 40 a day as soon as the present contract is completed.

The Baltimore & Ohio has ordered 2,000 box cars, divided between the Bethlehem Steel Corporation and the Standard Steel Car Co.

The Baltimore & Ohio has also ordered 25 large Santa Fe type locomotives from the Lima Locomotive Works.

The Atchison, Topeka & Santa Fe has ordered 15 locomotives from the Baldwin Locomotive Works.

The Rochester & Pittsburgh Coal and Iron Co. divided an order for 500 mine cars between the American Car and Foundry Co. and the Bethlehem Steel Corporation.

The Wabash has ordered 25 locomotives from the Lima Locomotive Works.

The Pressed Steel Car Co. has received an order for 400 steel gondolas and 300 composite cars for the Pittsburgh & West Virginia R.R. This is in addition to orders for rebuilding 400 hoppers for this line. The Pressed Steel also booked 525 box cars and 300 hoppers for the Atlantic Coast Line. The Virginia Bridge and Iron Co. booked 100 ballast cars for this road.

The Andes Copper Co. at Potrerillos, Chile, and the Chile Exploration Co. at Chuquicamata, Chile, have just placed with the Westinghouse Electric and Manufacturing Co. orders for 23 industrial electric locomotives for the purpose of inaugurating the electrification of the haulage systems at these two mining properties.

The order received from the Andes company calls for eight 10-ton trolley type locomotives and two 15-ton battery type locomotives, all of these units having modern contactor control. The Chile Exploration Co. has ordered six 70-ton combination trolley and battery type locomotives, three 25-ton pusher type locomotives.

Business Items

The G. A. Gray Co., manufacturer of planers, has moved into its new plant, on Gilbert Ave., Cincinnati.

The Independent Pneumatic Tool Co., of Chicago, has opened a branch office and service station at 1103 Genesee Bldg., Buffalo, N. Y.

The Saco Tool and Die Co., of Providence, has taken over the designing, toolmaking and die cutting business of the E. F. Rueckert Co.

The Electric Refrigeration Corporation has been organized by the merger of three prominent companies—the Kelvinator Corporation, the Nizer Corporation and the Grand Rapids Refrigerator Co.

The Wallace Barnes Co., Bristol, Conn., manufacturer of springs, has acquired a part interest in the Washburn Wire Co., Providence, R. I. The Washburn company manufactures spring wire, etc., and has supplied wire to the Wallace company for the manufacture of springs.

Divisional headquarters of the Pittsburg-Des Moines Steel Co., of Pittsburgh, Pa., for the Southeastern territory have recently been established in Atlanta, it is announced by C. R. Ford, who has been named manager of the branch. The new Atlanta offices are located in the Glenn Building.

The Wickwire-Spencer Steel Co. and subsidiaries report for nine months a net loss of $90,011 after depreciation, interest, etc. Net loss for the September quarter was $346,174, compared with a net profit of $80,381 in the preceding quarter and with a net loss of $249,989 in the September quarter of 1924.

The Rodman Chemical Co., of Verona Pennsylvania, manufacturer of carburizers' compounds, quenching and tempering oils, has announced the appointment of O. T. Muehlemeyer, of Rockford, Ill., as district manager of Illinois, Iowa and Wisconsin. Mr. Muehlemeyer was formerly metallurgist of the Barber-Colman Co., of Rockford.

The Stanley Works, New Britain, Conn., has acquired land at Antwerp, Belgium, with buildings formerly occupied by the Antwerp Street Railway Co. In making announcement of the recent purchase, C. F. Bennett, president, who has just returned from Belgium, said that the company would presumably establish a plant there for manufacturing purposes.

The Tool Equipment Sales Co., 15 S. Clinton St., Chicago, has been appointed exclusive factory representative of the Bicknell-Thomas Co., of Greenfield, Mass., manufacturer of tapping equipment. A complete stock of this company's product will be maintained at the store of the Tool Equipment Sales Co., for the convenience of the trade in the Chicago territory.

The H. E. McCoy Co., 1023 Bessemer Bldg., Pittsburgh, sales representative for Baker industrial tractors and trucks in western Pennsylvania and West Virginia, announces the appointment of George H. Criss as manager. Mr. Criss has been associated with the company for more than five years and has been identified with the sale of electrical machinery in the Pittsburgh district for nearly twenty-five years.

P. A. McArthur, of Atlanta, manager of the southeastern district for the Construction Machinery Co., of Waterloo, Ia., announces the recent appointment by that company of the Southern Machinery and Supply Co., of Montgomery, Ala., and the Muscle Shoals Supply Co., of Sheffield, Ala., as distributors of the company's line in the Alabama territory. The latter company is a new machine tool supply company formed recently at Sheffield by O. P. Green.

Henry Disston & Sons, Inc., of Philadelphia, manufacturers of saws, tools and steel, announce the appointment of H. A. Baxter as manager of their steel sales department, succeeding Charles T. Evans, who has retired on account of poor health after many years as manager of the department. Mr. Baxter has been general manager of sales for the Tacony Steel Co. and the Penn Seaboard Steel Corporation, of Philadelphia. Prior to that he was associated with the H. H. Franklin Automobile Co., the Midvale Steel Co., and the Tacony Ordnance Corporation.

Directors of the New Britain Machine Co., New Britain, Conn.., have outlined in a letter to stockholders a plan for the financial reconstruction of the company. Committees representing preferred and common stockholders have had this matter under consideration for a year. Stockholders owning more than 75 per cent of the preferred stock have filed their certificates and proxies with the Phœnix National Bank, Hartford, and the New Britain Trust Co., New Britain. A meeting is to be held Dec. 29, to take action on the proposal to authorize the directors to issue Class A preferred stock in exchange for the present outstanding preferred stock, share for share.

The following Chicago concerns have been granted certificates of incorporation by the Illinois Secretary of State:

Tower Forge, Inc., 7 S. Dearborn St., to manufacture and deal in machinery and hardware of all kinds.

International Can Co. of America, 2738 W. Van Buren St., to do a general manufacturing, machine shop and merchandising business.

Tennyson Troupe Manufacturing Corporation, 2068 Indiana Ave., to carry on a general foundry and manufacturing business.

The Vulcan Ingot Metal Co., Lanyon Pl. and Sheridan Road, North Chicago, to engage in smelting and refining, sale and purchase of metals and metal bearing or metal containing materials.

Obituaries

GEORGE MCDONOUGH, for twenty years superintendent of the B.-M. T. shops in Brooklyn, N. Y., died suddenly in his office on Dec. 16. He was 49 years old.

JAMES I. STEPHENSON, vice-president of the old Cincinnati Iron and Steel Co., now merged with Jos. T. Ryerson & Son, Inc., died suddenly on Dec. 10. He was 50 years old.

JOHN HENRY WIDDOWSON, of the firm of John H. Widdowson, Ltd., Britannia Works, Salford, Manchester, manufacturers of screw machines, died on Nov. 25. He was 68 years old.

JOHN M. WITTERS, manager of the Milwaukee branch of the E. J. Woodison Co., Detroit, foundry and shop supplies, died Dec. 13 in a Milwaukee hospital shortly after being stricken ill on the street. He was 55 years of age.

LAWRENCE GREER, chairman of the board of the Western Maryland Railway Co., died in New York City on Dec. 14. He was 53 years old. Alexander W. Miller, instructor in mechanics in the Montreal Technical Institute, died at his home in Montreal on Dec. 10.

WALTER H. WRIGHT, president of the Connecticut Valley Manufacturing Co., Centerbrook, Conn., died at his home in that town on Dec. 12. Mr. Wright was born in Clinton in 1865. He was connected with the Connecticut Valley Manufacturing Co., in the manufacture of wood boring tools for many years.

EDWARD D. ROCKWELL, an official of the New Departure Co., Bristol, Conn., died on Dec. 12, following a brief illness. Mr. Rockwell was born in Rome, N. Y., and spent his early life in the hardware business at Jacksonville, Fla. He came to Bristol in 1891 to engage in the manufacturing business with his brother. Mr. Rockwell was 70 years of age.

RICHARD I. MEALOR, for many years president of the Gainesville Iron Works, of Gainesville, Ga., operating one of the oldest foundry and machine shop plants in the Southeast, died recently at his home in Gainesville at the age of 77 years. Mr. Mealor was an active member of the Southern Metal Trades Association for several years.

ROBERT F. BOWER, 51 years old, founder and former president of the Bower Roller Bearing Co., of Detroit, died recently following a long illness. Ill health caused him to retire from business life a year ago and he had been confined to his home for several months. Mr. Bower was born in Lima, Ohio, and, while a young man, he moved to Dayton where he established the roller bearing company in 1907. In 1911 the company moved its factory and offices to Detroit.

Trade Catalogs

Air Compressors. General Electric Co., Schenectady, N. Y. Form No. GEA-233, a four-page circular, has been published to show the details of construction and the advantages of the General Electric single-stage air compressors. Several views and a list of applications are included.

Ball Bearings. New Departure Manufacturing Co., Bristol, Conn. Sheet Nos. 186 and 187 of the series on ball bearing applications have been prepared. These refer to ball bearings in the supercharger and to a pump drive for light-motor fire engines, respectively. The sheets include both a detail drawing of the parts to which they refer and a complete description of the applications. The Dec., 1925, revision of the automotive table of contents of the series has also been published.

Blowers and Air Washers. The American Blower Co., Detroit, Mich., has published a circular on household ventilating equipment and Bulletin No. 1923 on the "Sirocco" air washers. The latter is a 32-page, 8½x11-in. catalog of the "Sirocco" equipment. Many photographs and drawings of the details of construction are shown and a thorough explanation of the principles used in the air washers is given. Tables show the sizes and capacities of the equipment. The explanation of the construction is to sufficient length that it is both readable and quickly understood.

Chains, Silent. Boston Gear Works, Sales Co., 151 Lafayette St., New York, N. Y. A circular has been issued to show the principles of operation of the segmental bearing used in the Renold-Boston silent chain drives.

Electrical Control Equipment. General Electric Co., Schenectady, N. Y. An industrial control catalog bearing the number GEA-257 has been issued. This catalog furnishes information on representative lines of industrial control manufactured by this company and includes a reprint of the industrial control section of the general catalog, material on the care and operation of control devices, wiring diagrams of some standard controllers, push buttons and other accessories, reference tables, a list of publications and other useful information. It has 160 pages, 8x10½ in. in size and is bound n paper.

Balls, Bearing. "The Burden Bearers" is the title of a small booklet published by Standard Steel and Bearings, Inc., Plainville, Conn., on the forging of molybdenum steel balls. The booklet describes the hardening, lapping and inspection methods also.

Flow Meters, Electric. The General Electric Co., Schenectady, N. Y., has prepared bulletin No. GEA-133, showing illustrations of several types of General Electric indicating and recording flow meters for measuring steam, water, oil and gas.

Furnaces, Electric. Automatic & Electric Furnaces, Ltd., Elecfurn Works; 173-175 Farringdon Rd., London, E.C.1, England. Section A of the "Wild-Barfield" electro-magnetic furnaces for the automatic hardening of steel and Section B, of catalog 925, on "Wild-Barfield" tempering baths and ovens have been published under one cover.

General descriptions, specifications and many large illustrations of the equipment are given in the catalog which has twenty-four 9 x 11½-in. pages.

Milling Machines. The Kearney & Trecker Corporation, Milwaukee, Wis., has published the following single-page descriptive bulletins:

102 M, on the 1B plain motor-in-base milling machine; 103 M, on the 1B universal motor-in-base milling machine; 104 M, on the 2AS manufacturing motor-in-base machine; 105 M, on the 2BS plain motor-in-base machine; 204 M, on the 2B vertical motor-in-base machine; 107 B, on the 2A manufacturing belt-drive machine; 108 B, on the 2 B plain belt-drive machine; 201 B, on the 1A vertical belt-drive machine.

The following bulletins give the dimensions and specifications of the machines:

Bulletin No. 150, for the 1A, 2AS and 2A manufacturing types; No. 151 for the 1B, 2BS, 2B, 3B and 4B plain milling machines; No. 152, for the 1B, 2BS, 2B, 3B and 4B universal millers; No. 250, for the 1A, 1B, 2A, 2B, 3B and 4B vertical machines.

Bulletin No. 25 is a twelve-page, 8x11-in. illustrated description of K & T features. Details of the machine construction are individually illustrated and the reasons for the design are explained.

Pneumatic Tools. The Dayton Pneumatic Tool Co., Dayton, Ohio, has published Form 15-4-25, showing a sectional view of the new Dayton Chipper. Details of construction are pointed out with short paragraph descriptions. Many other models of Dayton equipment are also illustrated.

Presses. Niagara Machine & Tool Works, Buffalo, N. Y. Circular No. 218 is devoted particularly to the Nos. 615-E and 78-C presses. Other types are illustrated and noted also.

Pyrometers. Taylor Instrument Co., Rochester, N. Y. Catalog Part 4,000 is a fifty-six page, 7¼ x 10½-in. treatment of the Tyco pyrometers. Notes are included on the selection, operation and applications of the pyrometer. Many illustrations are given of the different types of indicating and recording, portable and stationary models. The various styles of accessory equipment are listed, illustrated and described and drawings show the methods of thermo-couple illustrations.

Five pages of tables of information useful in the field are appended to the catalog.

Speed Reducers. Boston Gear Works Sales Co., Norfolk Downs, Mass. Bulletin No. C10-25, entitled "Modern Speed Reduction," is a 36-page booklet covering the general line of Boston Gear Works equipment. Illustrations, data and drawings of the various types of reducers and accessories are included.

Transmission Equipment. Winfield H. Smith, Springville, Erie Co., N. Y. Catalog No. 22 covers speed reducing gears, pillow blocks, arbor presses, hangers, pulleys and couplings. Included in this 30-page booklet are illustrations of typical installations of the equipment, drawings and data tables of the various models.

Information tables facilitate the choice of installations for particular purposes.

Calendar of Local Meetings

National Association of Cost Accountants

San Francisco Chapter. Dec. 28. "Preparing to Start the New Year Right—What Should Be Done?"

Society of Automotive Engineers

Northern California. Dec. 29. "Problems of Fleet Operation," by Harold Jarvis.

New York. Jan. 14. Annual dinner, Hotel Astor.

Detroit. Jan. 26 to 29. Annual meeting.

American Society for Steel Treating

Buffalo. Jan. 21 and 22. Winter sectional meeting, Hotel Statler.

Hartford. June. Spring sectional meeting.

Forthcoming Meetings

American Association for the Advancement of Science. Annual meeting, Kansas City, Mo., Dec. 28, 1925, to Jan. 2, 1926. Barton E. Livingston, secretary, Smithsonian Institute Bldg., Washington, D. C.

American Society for Steel Treating. Winter sectional meeting, Hotel Statler, Buffalo, N. Y., Jan. 21 and 22. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Society of Automotive Engineers. Annual meeting, General Motors Bldg., Detroit, Jan. 26 to 29. Coker F. Clarkson, secretary and general manager, 29 West 39th St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Demand for pig iron is running mostly to small tonnage lots with prices firm and unchanged from the Dec. 11 level. Scrap buying continues slow. Steel shipments are turning more in the direction of the railroads and less toward the construction industry than heretofore. Steel plates are particularly firm at $1.90 per 100 lb., Pittsburgh, an advance of about 5c. per 100 lb. above a week ago, while bars and shapes are selling at $2 per 100 lb., f.o.b. mills, for shipments averaging 2,000 tons. Sheets are higher at Pittsburgh, than a week ago.

Non-Ferrous Materials—Firmness is shown with upward tendency in price in non-ferrous metals at New York, compared with the market as of Dec. 11. Antimony rose 1½c.; tin, ¾c.; lead, ¼c. per lb. Zinc remained unchanged while copper dropped ¼c.

(All prices as of Dec. 18)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.05
Northern Basic	24.27
Southern Ohio No. 2	24.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.37
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.16
Virginia No. 2	29.17
Basic	23.16
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	26.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	22.27
Basic	22.27
Bessemer	22.27

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00@5.50
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.50	3.89	3.15	3.50
No. 12	2.55	3.94	3.20	3.55
No. 14	2.60	3.99	3.25	3.60
No. 16	2.70	4.09	3.35	3.70
Black				
Nos. 18 to 20	3.15	4.15	3.75	3.90
Nos. 22 to 24	3.20	4.20	3.80	3.95
Nos. 26 and 27	3.25	4.25	3.85	4.00
No. 28	3.35	4.35	3.95	4.10
Galvanized				
No. 10	3.60	4.35	4.25	4.25
Nos. 12 to 14	3.70	4.45	4.35	4.35
No. 16	3.85	4.60	4.50	4.50
Nos. 18 to 20	4.00	4.75	4.65	4.65
Nos. 22 to 24	4.15	4.90	4.70	4.80
Nos. 26 and 27	4.30	5.05	4.95	4.95
No. 28	4.60	5.35	5.10	5.25

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameters Inches External	Diameters Inches Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness Decimal	B.W.G. and Fractions	Outside Diameter in Inches ½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	7.00	6.00@7.50	4.65†
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.85	4.15
Cold rolled strip steel	6.35	6.35	6.80
Floor plates	5.55	5.60	5.50
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.10
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.40	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	50@60%	55%	60%

Electric welding wire, New York, 3/32, 8.25c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb. *Flat, 1/16@¼-in. thick. †F.o.b. cars.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.50
Tin, 5-ton lots, New York			64.50
Lead (up to carlots) E. St. Louis	9.10	New York	10.25
Zinc (up to carlots) E. St. Louis	8.70	New York	9.75

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	23.50	21.25	20.00
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	19.87½	16.75	16.50@16.75
Copper bars, base	22.37½	21.25	22.37½
Copper tubing, base	24.75	24.75	24.75
Brass sheets, base	19.37½	19.12½	19.37½
Brass tubing, base	24.00	23.75	27.37½
Brass rods, base	17.12½	16.87½	17.12½
Brass wire, base	19.87½	19.62½	19.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	28@29	28.00	28.03
Zinc sheets (casks)	12.00	12.60@12.95	12.27
Solder (½ and ½), (case lots)	40.25	41.00	38@42
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			80.75
Commercial genuine, intermediate grade			56.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			14.50
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 31.00 Electrolytic 38.00 Shot			32.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00
Cold rolled sheets (base)			50.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.50@11.75	11.25	11.25@11.75
Copper, heavy, and wire	11.25@11.50	11.50	11.00@11.50
Copper, light, and bottoms	9.75@10.00	9.50	9.75@10.25
Heavy lead	8.00@8.25	7.50	7.75@8.25
Tea lead	6.00@6.25	5.00	6.75@7.25
Brass, heavy, yellow	7.50@7.75	7.25	7.25@7.75
Brass, heavy, red	9.50@10.00	9.50	8.50@9.00
Brass, light	6.00@6.50	6.00	7.25@7.75
No. 1 yellow rod turnings	8.25@8.75	8.00	7.50@7.75
Zinc	5.25@5.50	4.75	5.00@5.50

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$11.25	$11.45	$11.50
"A" Grade:				
IC,	14x20	8.85	9.40	9.50
	Coke Plates—Primes.			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.30	6.95	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.15@0.22	$0.19	$0.20
Cotton waste, colored, per lb.	.10@.15½	.10	.17
Wiping cloths, washed white, per lb	.17	36.00 per M	.15½
Sal soda, per 100 lb. keg	2.25	2.25	2.75*
Roll sulphur, per 100 lb. keg	3.75	3.75	4.50
Linseed oil, per gal., 5 bbl. lots	.99	1.10	1.02
Lard cutting oil, 25% lard, per gal.	.55	.50	.54
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.35	.35	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40%	40%	40–5%
Heavy grade	30–10%	35%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

*In 175 lb. kegs.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.0415	.0405
Brass rods	per lb.	.1712½	.1737½	.1637½
Solder (½ and ½)	per lb.	.4025	.40	.40@.41
Cotton waste	per lb.	.15@.22	.15@.22	14@21
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.55	3.55	3.38
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.35	.35	.29
Belting, leather, medium	off list	40%	40%	40–2½%
Machine bolts up to 1x30 in.	off list	40%	40%	45%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.46	$5.84	$5.65
Emery paper	10.71	11.00	10.71
Emery cloth	29.48	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.41	1.49
Cloth	3.55	2.67	3.20
Fire clay, per 100 lb. bag		.60	.75
Coke, prompt furnace, Connellsville	per net ton		3.50@4.00
Coke, prompt foundry, Connellsville	per net ton		5.00@6.00
White lead, dry or in oil	100 lb. kegs	New York, 15.25	
Red lead, dry	100 lb. kegs	New York, 15.25	
Red lead, in oil	100 lb. kegs	New York, 16.75	

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x¼-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ¼x¼-in., 2c. each. Discount 70% for $\frac{5}{16}$-in and smaller and 65% for ⅜-in. and larger.
Case hardened ¼x¼-in., 6c. each, less 50%.

Rivets, button heads, ⅜-in., ½-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in. $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1¼ to 2-in. long, all diameters, 25c.; ⅜-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅜-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Ga., Atlanta—H. W. Bellor, 116 Vedalo Way (sash and doors)—planing mill machinery (new and used.)

Ind., Bloomington—Shawnee Stone Co.,—electric traveling crane, 25 ton a.c. with runway about 80 ft. span, 30 ft. high.

Mass., Medford—H. Appleby, 15 Marston St.—15 to 20 in. surface planer and belting.

Mass., Roxbury (Boston P. O.)—Plaisted Co., 362 Dudley St.—wood saw outfit.

Mich., Detroit—Cadillac Motor Car Co., 2860 Clark Ave.—equipment for 2 story, 150 x 207 ft. addition to automobile service department. (to be purchased later)

O., Columbus—W. M. Ritter Lumber Co., 115 East Rich St., S. L. Calfee, Supt.—planing, dimension mill and additional sawmill equipment for new plant at Barrett, W. Va.

Wis., Wabeno—Wabeno Mfg. Co., F. E. Colburn, Purch. Agt. (wood products)—band saw, resaw.

Que., Barraute—M. A. Grandlvis—sawmill machinery.

Opportunities for Future Business

Ala., Anniston—The M. & H. Valve Co., J. W. Conway, Pres., Atlanta, Ga., recently incorporated, awarded contract for the construction of a plant and machine shop here. Estimated cost $70,000. Noted Dec. 17.

Calif., San Francisco — H. H. Meyers, Kohl Bldg., Archt., is receiving bids for the construction of a 1 and 2 story factory at Third St. near Paul Ave. for Electric Storage Battery Co., 1526 Bush St. Estimated cost $125,000. Noted Oct. 22.

Calif., Stockton—Calaveras Copper Co., Copperopolis, plans the construction of a refinery and wire drawing plant on Stockton waterfront. Estimated cost $500,000.

Conn., Bristol—New Departure Mfg. Co., awarded contract for the construction of a 1 story, 24 x 218 ft. addition to factory for the manufacture of ball bearings on Center St.

Conn., New Britain—The Stanley Works, awarded contract for the design and construction of a 110 x 250 ft. building to be used for gauging rolls and annealing furnaces and a 46 x 82 ft. addition to machine shop.

Ill., Chicago—Bell & Howell Co., 1803 Larchmont Ave., moving picture machine manufacturers, awarded general contract for the construction of a 6 story, 76 x 81 ft. factory. Estimated cost $200,000.

Ill., Rock Falls—Russell-Burdsall-Ward Co., South St., Port Chester, N. Y., awarded contract for the design and construction of a 1 story, 85 x 160 ft. wire mill here.

Ind., Indianapolis — Standard Oil Co., Davidson and Lord Sts., awarded contract for the construction of a 3 story oil storage plant including machine shop, warehouse, etc. Estimated cost $150,000.

Ind., Rushville—Dill Foundry Co., will build a 1 story, 140 x 180 ft. foundry. Estimated cost $50,000. Private plans. Noted Dec. 10.

Md., Towson—Black & Decker, awarded contract for the construction of a 1 story, 100 x 200 ft. machine shop. Estimated cost $75,000. Noted Feb. 12.

Mass., Arlington (Boston P. O.)—H. A. Phinney, 33 Gray St., awarded contract for the construction of a 2 story 35 x 45 ft. repair and service garage. Estimated cost $40,000.

Mass., Dorchester (Boston P. O.)—Rudnick & Grishaver, c/o White Construction Co., 11 Beacon St., Boston, Contractor, awarded contract for the construction of a 1 story repair and service garage on Washington St. here. Estimated cost $50,000.

What This Section Is

Machinery Requirements and Industrial Construction is a reliable machinery market, because every item is reported first-hand by our own correspondents, scattered over the United States and Canada. These leads are verified by our men. We do not use newspaper clippings, nor do we listen to any hearsay or rumors. These sales leads are as accurate as our men can make them, and as timely as weekly publication will permit.

This market is for *American Machinist* subscribers. It covers the same machinery fields as does the paper. Here will be found inquiries for machine tools, presses, hammers, welding, forging and heat treating equipment, wood working machinery, cranes, hoists and other material handling machinery for the shop.

Here also will be found reports of proposed industrial construction, where sooner or later machinery will be needed.

Are you making the most of the opportunities listed here?

Mass., Indian Orchard—The Chapman Valve Mfg. Co. plans the construction of a 2 story, 23 x 42 ft. addition to plant at 203 Hampshire St. Estimated cost $20,000.

Mass., Malden (Boston P. O.)—Andrew Investment Co., c/o C. F. Springall, 50 Concord St., Archt., awarded contract for the construction of a 2 story, 110 x 225 ft. repair and service garage at 11-13 Charles St. Estimated cost $100,000.

Mass., Somerville (Boston P. O.)—Winter Hill Realty Co., Inc., Mr. Nute, Pres., 383 Broadway, plans the construction of a 2 story repair and service garage on Bond St. Estimated cost $100,000. Architect not selected.

Mass., South Boston (Boston P. O.)—A. Ketnes, 58 Champney St., awarded contract for the construction of a 1 story, 60 x 162 ft. auto repair shop. Estimated cost $40,000. G. B. Powell, 64 Pleasant St., Dorchester, Archt.

Mass., Winchester — J. Haggerty, 736 Main St., will build a 2 story garage and repair shop at 704 Main St. Estimated cost $40,000. Kennedy & Olmsted, 80 Boylston St., Boston, Archts. Noted Aug. 6.

Mass., Woburn—B. F. Waldron & Sons, awarded contract for the construction of a 2 story, 50 x 85 ft. auto repair building. Estimated cost $40,000.

Mich., Detroit—Michigan Copper & Brass Co., 5851 West Jefferson Ave., copper, brass and aluminum sheets manufacturers, awarded contract for the construction of addition to aluminum smelting building.

Mo., St. Louis—G. T. Burdeau Realty Co., 801 Chestnut St., will build a 1 story, 228 x 247 ft. garage. Estimated cost $150,000. J. T. Craven Engineering Co., Century Bldg., Engr. People's Motorbus Co., 583 Adelaide St., lessee. Noted Oct. 1.

N. Y., New York—G. Ringler & Co., East 92nd St., plans a 6 story, 100 x 100 ft. garage on East 91st St. Estimated cost $200,000. Architect not selected.

N. C., Ashville — Ashville Supply & Foundry Co., D. S. Hilderbrand, Pres., plans the construction of plant including brass foundry, machine, pattern, forge and welding shops, etc. Estimated cost $200,000.

O., Canton—North Market Realty Co., is receiving bids for the construction of a 2 story, 88 x 200 ft. garage on Tuscarawas St. W. Estimated cost $150,000. Cadillac Garage, lessee.

O., Cleveland—The Cleveland Cap Screw Co., J. W. Fribley, Pres., 2921 East 79th St., plans the construction of a 3 story, 70 x 90 ft. heat treating plant and chemical laboratory. Estimated cost $75,000. Private plans.

O., Cleveland—The Elwell-Parker Electric Co., M. S. Townson, Gen. Mgr., 4205 St. Clair Ave., awarded contract for the construction of a 1 story, 60 x 60 ft. heat treating plant for the manufacture of electric industrial trucks and tractors. Estimated cost $40,000.

O., Cleveland — The Ferro Machine & Foundry Co., J. T. Stoney, Mgr., East 66th St. and Hubbard Ave., awarded contract for the construction of two 1 story, 60 x 160 and 60 x 140 ft. factory buildings. Estimated cost $75,000.

O., Cleveland—The National Steel Barrel Co., 3860 East 91st St., awarded contract for the construction of a 1 story, 162 x 183 ft. addition to factory. Estimated cost $150,000.

Okla., Blackwell—Acme Foundry & Machinery Co., Coffeyville, Kan., plans the construction of 56 x 850, 60 x 100 and 40 x 60 ft. foundry buildings here.

Pa., Allentown—Bonney Forge & Tool Works, has work under way on the construction of a 110 x 200 ft. addition to plant to increase the capacity.

Tenn., Oneida—Oneida Machinery Co. awarded contract for the construction of a new 1 story, 75 x 142 ft. machine shop.

Vt., Brattleboro—Central Vermont Railroad Co., plans the construction of a 1 story storehouse, machine and repair shops at Railroad Yards. Estimated cost $30,000. P. D. Fitzpatrick, St. Albans, Ch. Engr.

Wash., Seattle—Eldridge Buick Co., 802 East Pike St., is receiving bids for the construction of a 3 story, 90 x 170 ft. auto factory at 45th and 10th St. N. E. Estimated cost $200,000. Architect not selected.